# Developing a Field Artillery Training System Based on Devices and Simulations: Definition of the Gunnery Team Trainer

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for

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This development of a concept and functional description of the Gunnery Team Trainer (GTT) is based on the results of analysis conducted under three separate tasks that comprise the initial part of this program. All of the earlier analyses were updated, and the revised products are incorporated into this report The process of developing the GTT definition is described. A system definition of the GTT is presented, along with information about using it at the Field Artillery battery level. In addition, a representative set of fire mission procedures is included as a basis for conducting unit training exercises. (cont)

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The description of the GTT illustrates how it makes use of operational equipment and simulation to provide for effective training while controlling the expenditure of training resources.

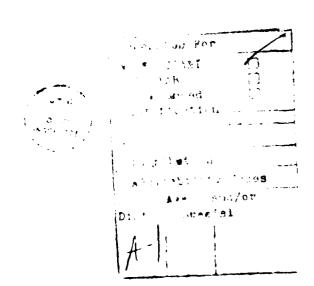
The summary of the entire program (four tasks) which is included in this report and its Appendices will help to extablish other applications of the techniques. e ske de

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#### **PREFACE**

This report is the fourth and last of a series generated by the program to develop a Field Artillery training system based on devices and simulations. That system is now designated as the Gunnery Team Trainer. Each of the preceding reports documented a specific analytical phase of the program. This report is different. It describes the process and the output of the fourth program task but it also contains parts of the earlier reports that are directly relevant to the description of the Gunnery Team Trainer. Each of these incorporated parts has been revised and developed as this program matured toward its completion. Thus, while designated as the Task Four Report, this document represents the summation of the entire program.



#### **ACKNOWLEDGMENTS**

The Dunlap staff is grateful for the continuing support of Dr. Michael Strub, the ARI Contracting Officer's Technical Representative and of Dr. Lloyd Crumley, Chief of the ARI Scientific Coordination Office at Fort Sill, OK. Each has contributed in his own special way to the technical guidance of this program as well as to the more prosaic tasks of administration and data collection. In both the guidance of the study and development of information sources, Dr. Crumley has been of special service at the interface with the Field Artillery School.

A very large number of the Officers, Enlisted personnel and Civilian employees of the Field Artillery School have given generously of their Field Artillery and training knowledge and expertise. We are grateful for their help and support. It is appropriate to acknowledge especially the guidance given us by LTC L.E. Stunkard, Major J.M. Haning, and Major Kieran McMullen. Their professional, practical insights have increased the potential utility of this program.

The Dunlap staff assigned to this program has consisted of Dr. Richard F. Bloom, John W. Hamilton, and Carol W. Preusser, Research Associate, working with Edward W. Bishop-the project Responsible Officer. Dr. Richard D. Pepler and Leroy L. Vallerie have also participated in the earlier parts of this work. The preparation and production of the products of this effort have been the responsibility of Frances B. Kowaleski and Janet C. Vartuli. The talent and dedication of each of these people has contributed to the quality of the program.

While we acknowledge the help and support of many people, the outcome of this program and the quality of its products are solely the responsibility of the Dunlap staff.

**EWB** 

# TABLE OF CONTENTS

		Pag
I.	INTRODUCTION	1
	A. Background B. Program Scope and Objectives	1 2
II.	PROGRAM OVERVIEW AND ANALYSIS RESULTS	4
	A. Overview of the Program B. Analysis Results	4
III.	TASK FOUR APPROACH	12
	<ul><li>A. Objectives</li><li>B. Scope of Task Four</li><li>C. Method</li></ul>	12 12 13
IV.	GTT SYSTEM CONCEPT	17
	A. Selection of a System Concept B. GTT System Concept	17 25
v.	GTT SYSTEM REQUIREMENTS	31
	A. Introduction B. Requirements	31 31
VI.	GTT FUNCTIONAL DESCRIPTION	35
	<ul><li>A. Introduction</li><li>B. GTT Top-level Functions</li><li>C. Tier One Functions</li><li>D. Implementation</li></ul>	35 35 37 42
VII.	UTILIZATION	44
vIII.	DISCUSSION	46
	<ul><li>A. Program Review</li><li>B. Training Requirement Index (TRI)</li><li>C. GTT Research Application</li></ul>	46 47 48
REFE	CRENCES	51
GLOS	GLOSSARY	

#### I. INTRODUCTION

## A. Background

Training for Field Artillery (FA) operations is a complex process. artillery operation involves a wide range of human skills and makes use of a number of technologies. Artillerymen are called on to perform tasks ranging from the simple motor activities of handling ammunition to the relatively sophisticated tasks of planning, coordinating and controlling fire missions. technologies include computer operation and digital communication as well as laser operation, while some artillery jobs are still based on simple mechanical principles. The FA training program at both the entry level and at the advanced unit level must be capable of dealing with the kind of diversity noted above. In addition to the problems created by the diverse nature of the tasks, FA training must cope with the fact that moving, emplacing and firing an artillery weapon requires a substantial quantity of resources. Thus, the selection of live-firing as a training medium is many times not acceptable. The cost of vehicle fuel is already high and not likely ever to move lower. Live ammunition is also expensive. To use live-firing safely in a reasonably realistic setting requires sizable range areas. This in turn raises the issue of environmental impact both on the range and in adjacent areas. Finally, the use of operational equipment in training does impose wear and tear that might adversely affect the readiness and reliability of the equipment.

Artillery training is, then, a complex job and if conducted with operational equipment, is fraught with a number of negative aspects, including potentially high costs for resources and risks to the environment and the community adjacent to the range. Compounding the effect of each and all of these problems is the growing demand for quality in training. This demand is created by the growth of current technology and the possible application of even more advanced technology. Finally, artillery training just as all military training must be responsive to the characteristics of the trainees. Thus, in addition to the problems and demands noted above, FA training must be adaptable to what at at times may be a wide range of trainee capability.

An approach to training that has the potential for coping with many of the above issues would have the following characteristics:

- o The training requirements would be developed from a systematic analysis of the operational tasks.
- o The training process would be performance-oriented deriving training objectives from operational performance standards.
- o The training would be implemented to some appropriate optimum level through the use of training devices and simulations.

The research program to be reported here was initiated in at least partial response to the issues that are noted above. The program did not undertake to address the entire body of field artillery training but focussed on a critical

segment--the gunnery team during target engagement. The program emphasized the method for developing a system for training and is intended to have broad application to FA training system development.

In Section B, below, the scope and objectives of this program are presented. This is followed by a description of the analytical approach used in the program.

### B. Program Scope and Objectives

### 1. Scope

The name that was given to this research program is Developing a Field Artillery Training System based on Devices and Simulations. suggests the connotation of including all FA training and of totally synthetic means of training. It is actually the case that the scope was defined to include only the activities of the gunnery team during target acquisition and engagement. The title, "gunnery team," refers to the personnel assigned to a Battery Fire Direction Center (FDC) and Howitzer Section, plus the Fire Support Team (FIST) and observer (FO) personnel who are attached to the supported maneuver organization. In total, this includes 16 functional positions (jobs) that represent three Military Occupational Specialties (MOS): Cannon Crewman; 13E, Fire Direction Specialist; and 13F, Fire Support The scope was further defined to include only the "integrated" Specialist. operation of the gunnery team, which is to say, only those activities the individuals perform collectively. This excludes support tasks, such as maintenance, and any that are exclusively individual, such as use of individual protective equipment.

To help put this scope in perspective, it should be noted that the direct support missions of a howitzer battery are made up of four segments:

- Occupy which is all of the activity involved in the emplacement of that battery on a selected or designated site.
- o Engage which includes all of the activities associated with the actual conduct of a fire mission.
- o March Order which is the preparation to move from an occupied site.
- o Move which is the transportation of the battery to a newly designated site.

While each of these four segments is important and there is a dependency among all of them, the critical functions of providing artillery fire occur in the Engage segment. Thus, the scope of the program focuses on the most significant part of the Artillery's overall mission. Also, the Engage segment is comprised of functions and tasks that are clearly unique to the Artillery. Within the Engage segment, the major functions performed by the gunnery team are:

- o Locate targets.
- o Initiate and coordinate fire missions.

- o Conduct technical fire direction.
- o Deliver fire.
- o Communicate and report.

These functions are implemented through a number of Soldier's Manual tasks for each MOS. These tasks formed the data base on which this program was built.

In terms of the research that was performed, the scope of this program was defined as follows: to develop and apply system and task analysis techniques to a selected baseline system leading to the development of a description of a system for training. The analytical processes were adapted from traditional techniques to provide the information needed to develop the training system specification. In the course of this program that system has come to be known as the Gunnery Team Trainer or GTT. That name will be used throughout this report.

## 2. Objectives

There are essentially two objectives to which this research was directed. First, the program was to develop the description of a system for training the gunnery team in the engagement mission segment to be applied at the unit level. Second, the program was to document and illustrate, for other applications, the analytical processes that were used. This report presents the Gunnery Team Trainer specification (first objective) along with the relevant analysis products. The analysis processes are described (second objective) in the earlier reports of this program (1, 2 and 3).\*

<sup>\*</sup>See References, page 51.

#### II. PROGRAM OVERVIEW AND ANALYSIS RESULTS

#### A. Overview of the Program

As indicated in the previous section, this program was structured as a sequence of analytical steps leading to a description of a system for training (i.e., the Gunnery Team Trainer). This approach follows the proven process of system development that is used in many contexts. It is, for example, consistent with the approach specified for use in the human factors development of military systems (4). That approach begins with the definition of a mission, for a new system, and proceeds through the definition and allocation of functions (among equipment, software and personnel). Following that, the human functions are analyzed to a level of detail from which personnel and training requirements, performance measures and conditions of performance can This approach is closely similar to the Analysis Phase of be identified. Instructional System Development, a process that has been extensively used in military training development. In this program, the analysis of the baseline system followed the concept of these specified approaches. Because the baseline is an operational system, the initial steps of mission definition and function allocation were not needed. The analytical process began with the compilation of task information and its analysis into training characteristics. One part of the analysis was devoted to the determination of the criticality and difficulty of tasks (in the baseline). The approach for that was adapted from an ARI method developed for the determination of training device requirements The results of the baseline analysis permitted the definition of training requirements, performance measures and standards, and similar baseline attributes from which Gunnery Team Trainer characteristics were derived.

Administratively, the program was segmented into four tasks:

- 1. Baseline System Analysis
- 2. Training Analysis of the Baseline System
- 3. Evaluation of Training Devices and Simulations
- 4. Definition of the Gunnery Team Trainer

Figure 1 is a flow diagram of the entire program which shows the sequence of the several processes. It also indicates the administrative task under which each process was performed.

#### B. Analysis Results

The analytical processes and results that comprise the basis for the GTT description contained in this report are summarized below. As has been noted, each of the first three program tasks has been separately reported. This summary is provided primarily to give a frame of reference for the GTT material that follows. This summary will also help the reader better understand the products of earlier tasks that are incorporated in this report. For example, the OSD produced in Task One was the basis for the separate fire mission OSDs that are included here as a training guide for the GTT.

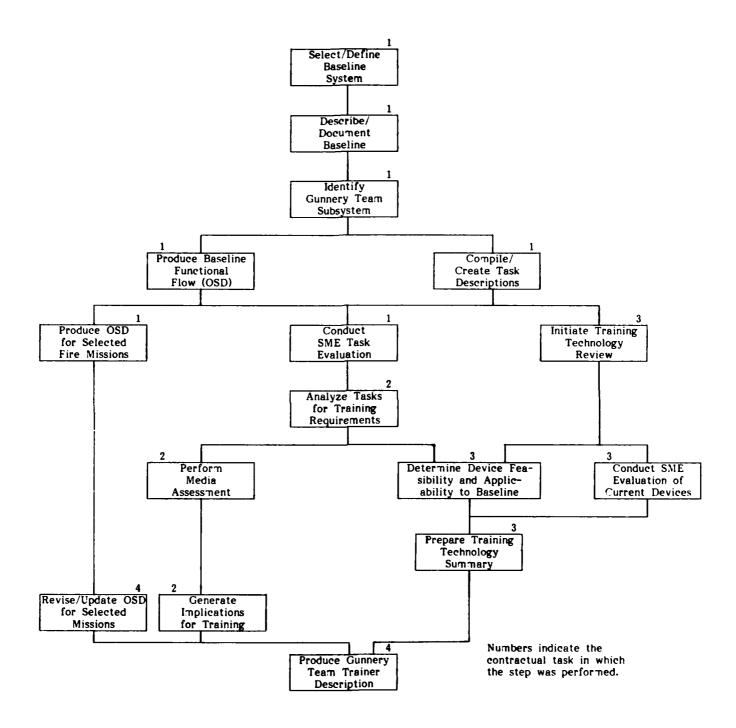


Figure 1. Program Flow Diagram

#### 1. Task One Results

The first task in this program was completed and reported in September 1983. The purpose of that task was to analyze the baseline system, thereby developing the data base for subsequent tasks. A brief summary of that initial task is given here.

The method by which the baseline system was analyzed is of interest because both the product of this program and the method used are to be transportable to other Field Artillery applications. The analysis performed in Task One followed traditional task analysis procedures, such as one documented for the Army Instructional System Development (ISD) approach (12). The first phase of the ISD process, "Analyze," was followed to the extent applicable to this program. Lists of tasks performed by each section were compiled by combining ARTEP tasks and the related Soldier's Manual (SM) tasks. were structured into an operational sequence diagram (OSD) which identifies the personnel who perform each task and shows the operational and communications flow among the tasks. It should be noted that this analysis included all of the tasks involved in a complete, representative fire mission, including all four segments: Occupy, Engage, March Order, and Move. Only tasks already described by the Army were to be used. However, for the Ground Laser Locator Designator (GLLD), the FIST DMD and the Battery Computer System (BCS), several "new" tasks had not been described by the Army and had to be derived from manufacturers' documentation and technical manuals. In total, approximately 260 tasks are included in the baseline description and about 10% The task lists and OSD are to be refined in the last stages of this program. More new tasks may be identified and other changes may be made.

Next, an evaluation process was established to obtain Subject Matter Experts' (SMEs) assessment of the difficulty of each task and its effect on baseline system performance. The evaluation was based on a procedure developed for ARI in another program (11). It was performed by USAFAS personnel selected by the USAFAS representative to this program. A group of between 3 and 5 SMEs was selected for each section (FIST, FDC and HOWITZER). Each group was asked to review and confirm or correct the task data for its section. Under the guidance of contractor staff, the SME group then evaluated each task relative to each defined attribute. The SMEs were instructed to reach a consensus on each evaluation and were helped in this process by the contractor staff. The approach used to achieve consensus was not unlike the Delphi method. Whenever there was not initial unanimity of opinion, the SMEs discussed the differences among themselves with contractor staff guidance. The discussion was continued until the SMEs agreed upon a rating. Four task attributes were defined to be judged for each task:

- o System Performance Effects (or criticality) on a scale of 1-3.
- o Delay Tolerance (Does the task have to be initiated immediately upon receipt of the initiating stimulus?) on a scale of 1 or 2.
- o Task Difficulty on a scale of 1-4.
- o Practice Required on a scale of 1-5.

These attributes are judged to be sufficient to define a relationship between system performance and task performance and to establish the inherent difficulty of each task. The first two attributes listed above--System Performance Effects and Delay Tolerance--relate to the interaction between task performance and system performance. The second two relate to the inherent difficulty of the task. The rating scales are not measures, nor are they truly quantitative. The ratings are simply ordinal; for each attribute, the highest number represents the least desirable state, i.e., most effect on system performance, most difficult, most practice required and no delay tolerance. The number "one" denotes the other extreme, i.e., "no effect on system performance," etc. These ratings and definitions follow traditional evaluative ranking schemes, such as ISD and the earlier ARI study (11 and 12). Written definitions of each attribute and its rating scale were used in the SME task evaluation process.

When all of the SME groups had made their evaluations, it was found that they had not used the rating of 1--"no effect"--for System Performance Effects, and they had not used the rating of 1--"no practice required"--for Practice Required. Thus, the scale values actually obtained were:

o System Performance Effects: 2 and 3

o Delay Tolerance: 1 and 2 o Task Difficulty: 1-4

o Practice Required: 2-5

Because these attributes and ratings were definable in relatively simple and explicit terms, one can be confident that the SME assessments are acceptably valid. The focus of this program, however, is on more global training needs, and so a means for compiling the four attribute ratings was developed. This combined index is called the Training Requirements Index (TRI) and is an ordinal representation of the need for training. First, the two performance attribute ratings (System Performance and Delay) were added together and the two difficulty ratings were added together for each task. This produced two indices: "Performance Effects" with values of 3, 4 or 5, and "Task Complexity" with values of 4 through 9. The TRI could have been simply the sum of these two indices, but to give greater apparent scale distance and to emphasize the effect of extreme ratings, it was decided to square each of the combined indices and then add them. The resulting TRI thus has a possible range between 25 and 106. However, the highest TRI actually achieved was 89.

It is appropriate to think of the TRI as denoting a priority for training consideration. That is to say, any task with a high TRI should be considered for expenditure of training resources before a task with a low TRI. This is an ordering or priority, and no absolute values are implied. Also, the TRI addresses the characteristics of each task apart from all other tasks. Thus, in addition to the TRI, the functional relationships among tasks must be considered in making training decisions. For example, it is quite likely that a task which is performed in relative isolation, but which has achieved a high TRI, will be given different training consideration than a task with a comparable TRI which is performed as part of an integrated team activity. Also, of course, the available or potentially available means for training will help determine training resource expenditures.

In summary, the results of Task One are a task inventory and an Operational Sequence Diagram of the Baseline System and an evaluation of each task as to criticality/performance effects and difficulty. A summary index for priority in training consideration—TRI—is computed for each task. The total inventory and system OSD constitute a system description that is potentially useful in other Field Artillery applications beyond this program. That part of Task One that relates to the Gunnery Team in target acquisition and engagement became the data base for Task Two: Training Analysis.

The ultimate development of the OSD is in five representative fire mission OSDs. Each is a description of the gunnery team activities during the Engage segment. Together, they encompass the full range of fire missions that could be assigned to the baseline system. In the development of the GTT it was determined to be essential to deal with performance-based training derived from actual fire mission procedures. Thus, the specific fire mission OSDs are incorporated into the guidance for using the GTT. Therefore, they have been reproduced and are attached as Appendix A. These OSDs are current as of the date of this report and provide a complete description of the team's activity during Engage. Further guidance as to how they are used in the GTT is presented in Section VII, Utilization.

#### 2. Task Two Results

Task Two was the Training Analysis of the Baseline System. It was devoted to the analysis of the Gunnery Team (Howitzer Section, Battery Fire Direction Center and Fire Support Team/Forward Observers) as it performs the Engage segment of a fire mission. The analysis was directed toward development of a detailed description of each Soldier's Manual task and subsequently the definition of training requirements and implications. Also, the applicability of representative media for training each gunnery team task was determined. The product of Task Two is made up of baseline analysis results as well as some generalized implications for a training system. That data base along with the Task Three results comprise the input to the development of the GTT description.

In Task Two, the detailed analysis of each Gunnery Team task was required to define the specific human performance (or behavior) that would have to be trained. This was accomplished by an Input-Process-Output (IPO) analysis which identified the specific component processes of each task, along with the performance measures and criteria as well as conditions of performance. As part of the IPO analysis process, information relevant to training was compiled onto a single data sheet. A total of 58 Soldier's Manual tasks was analyzed. These are all of the tasks that occur in any fire mission performed by the baseline system.

Following the IPO analysis, the task data were subjected to an analysis of training implications. As a first step, the baseline system performance requirements and measures of effectiveness were compiled from the IPO. This information describes what the baseline system personnel must do operationally and the criteria by which what they do can be evaluated. The information was compiled for each task at the level of detail produced by the IPO. These data are the last to be generated by analysis of the baseline. The

next step was to combine this information into statements of Implications (or General Requirements) for a training system. These statements describe the nature of the training, i.e., what behaviors are to be trained, and the criteria of time and accuracy to be used. For each Soldier's Manual task, four pieces of information were produced:

- o Overall training requirement statement.
- o Training implementation statement (specific skills and knowledge).
- o Time criteria.
- o Accuracy criteria.

The final part of the second task in this program was the Training Media Assessment. In that assessment each skill and knowledge listed in the Training Implementation statement was assessed separately. A representative array of six training media ranging from traditional classroom instruction to practice using operational equipment was defined. The extent to which each medium was judged to be feasible and appropriate for each implementation area was rated. The program staff made these judgments using a defined rating procedure and numerical scale.

The final product of Task Two consists of the data recorded on several analysis sheets for each of 58 Soldier's Manual tasks. There are data sheets for the Input-Process-Output analysis, the Training Implications Analysis, and the Training Media Assessment. This compilation of information became the data base for training device and simulation evaluation (Task Three). In the development of utilization guidance for the GTT, it has been determined that the data contained in the IPO analysis sheets would be useful to the GTT instructor(s). Those data provide a description of the specific performance that is required, down to a subtask or element level. The data also include the definition of appropriate performance criteria and measures. All of this information can and should be used in the planning and conduct of training. Therefore, the IPO analysis sheets—updated as of the date of this report—are attached as Appendix B. Further information about how they are used is contained in Section VII, Utilization.

#### 3. Task Three Results

Task Three was devoted to an assessment of Field Artillery training devices and simulations, including existing as well as planned equipment and systems. The purpose of this assessment was twofold: to evaluate existing and developing devices for inclusion in the Gunnery Team Trainer, and to identify training device and simulation areas in which further development would be of value. The data base for this assessment was the compilation of analysis data for the 58 Soldier's Manual tasks produced in Task Two. This compilation extends over about 250 pages and represents the level of detail necessary for the analyses that were made early in the program. There is, however, a degree of repetition among the 58 tasks and their several subtasks. For example, communication—both voice and digital—is an essential component of virtually every task. In addition, the several tasks assigned to each section

often make use of the same equipment and/or substantially the same procedures. Setting and laying the howitzer, for instance, uses similar procedures for both elevation and deflection, and both use closely related components of the Thus, there is a clear opportunity to aggregate these tasks into smaller sets based on functional, procedural and equipment similarities within The value of this aggregation is that it allows a more comprehensive statement of training requirements, such as "operate the Digital Message Device (DMD)," and not "operate the DMD to designate a target for laser-guided munitions" or "... to request/adjust area fire," etc. The concept of aggregation also is compatible with the process of defining an integrated training system. Up to this point in the program, the analysis to an extensive level of detail was necessary to identify completely all of the behaviors to be trained, the relevant performance measures, etc. Now it is the objective of the program to reflect each of these requirements in an integrated system for training: the Gunnery Team Trainer. The process of aggregation resulted in a total of 12 performance statements, each of which is unique to a section, equipment and procedure. In addition, there is an "aggregated task" in each section that expresses the requirement for timely performance under stated environmental conditions. There are 6 aggregated tasks related to FIST/FO, 4 to FDC and 5 to Howitzer.

The assessment of training devices and simulations was made, then, on the basis of 15 aggregated tasks. This assessment also required the identification and definition of the devices and simulations (referred to in Task Three collectively as "technologies"). An extensive search of the FA literature and discussions with USAFAS personnel resulted in a set of 14 existing and 9 planned or developing technologies for assessment. A review of related documentation was made, and interviews with subject-matter experts (SMEs) at USAFAS were conducted on several occasions. This provided the descriptive information necessary for the analytical assessment, and the subjective information necessary for user reaction assessment, for each training device and simulation.

None of the existing training technologies was assessed as "Excellent" on any aggregated task. Those that were considered "Good" for certain tasks include:

- o Firing Battery Trainer (FBT), for three of the five Howitzer Section tasks (communications using the GDU/SCA; aiming the howitzer; loading, firing and clearing the howitzer).
- Miniature Moving Target (MMT) with the M31 Subcaliber Trainer, for the one Howitzer Section task of loading, firing and clearing the howitzer and for three of the six FO/FIST Section tasks (using the G/VLLD; using the LRF; fire mission decision-making).
- o Battery Computer System/Interface Training System (BCS/ITS), for one Howitzer Section task of communicating with the GDU/SCA, and for two of the four FDC Section tasks (using the BCS for RFAF messages; using the BCS for TACFIRE messages).

- o Battle Simulations for the one FDC Section task of mapping target information, and for two FO/FIST Section tasks (mapping target information; fire mission decision-making).
- o G/VLLD Trainer, for the one FO/FIST Section task of using the G/VLLD.
- o G/VLLD with TV Camera, for the one FO/FIST Section task of using the G/VLLD.
- o Training Set Fire Observation (TSFO), for the one FO/FIST Section task of mapping target information.

The rest of the training technologies were, at best, "Fair." Virtually all the devices are aimed at practicing skills at the Section level, although some (FBT, FASPR and TSFO) can be used in combination to accomplish a form of integrated (closed loop) training for the entire gunnery team. None of the technologies reviewed does a "Good" job in creating the various extreme tactical and environmental conditions necessary for complete and thorough training of the target acquisition and engagement tasks, and "Major" developmental efforts are foreseen if that capability is to be achieved. "Minor" to "Moderate" developmental efforts are seen as necessary to provide technologies that yield acceptably adequate training capabilities for every other task.

Some of the necessary improvements in training technology are being attempted with the devices and simulations currently under development. In this assessment, three of the nine developing technologies are considered to have potentially "Excellent" capabilities, at least in concept if not in practical implementation and prototype testing. Those items are the Indirect Fire Engagement Simulation (IFES), the Closed Loop Training Concept, and the Howitzer Recoil Simulator.

In the same vein, four of the developing technologies are considered to have potentially "Good" capabilities. They are the FA Fire Support Training System (FAFSTS), the FIST/FO Interactive Videodisc Trainer, the Copperhead Moving Target, and the Simulated Tank Antiarmor Gunnery System (STAGS).

In addition to the systematic assessment of training technologies, Task Three included a brief review of the "nontechnical," subjective factors that affect training device usage. This review was included as a reminder that adequate training technology of itself cannot insure successful development and use of training resources.

Because of their direct application to the description of the GTT, the two major products from Task Three have been attached to this report. Appendix C contains the information about the aggregated tasks summarized separately for each subsystem. Each summary shows the Soldier's Manual tasks that comprise each aggregated task. Also, the personnel who perform each aggregated task are identified, and the training media assessment results and TRI have been averaged for each aggregated task. The Task Three evaluation of training technology is also presented in summary tables, one for each subsystem.

#### III. TASK FOUR APPROACH

#### A. Objectives

As the final task in the program, the major objective of Task Four is to present a description of a Field Artillery training system. In addition, this task encompasses the revision and updating of the products of the earlier tasks. Thus, this report provides both a description of the Gunnery Team Trainer and a summary of the overall program. The objective of Task Four can be viewed as an integration of all of the analytical products into a training system context. In this task, then, the building blocks created by all of the earlier analyses are assembled into a system description: it is a process of synthesis. The specific training needs of the artillery are recognized in this process as are the basic precepts of good military training.

In addition to the basic objective described above, Task Four has a second objective of serving as a demonstration of the processes used in the program. This program was defined and carried out not simply as an exercise in analysis and synthesis. It is intended also to illustrate the processes that were used as being exportable to other Field Artillery training system development activities. Each of the three preceding task reports describes the specific processes that were used. These can serve as guides for the application of those processes in other settings. This report illustrates how the products of all the processes are combined.

The final aspect of the purpose or objective of Task Four is one that was adopted during the course of the program. From its inception, the program has been directed toward the development and use of an analytical process in defining a system for training. As the program developed, it became very clear that the definition, measurement and evaluation of gunnery-team members' performance would be a significant part of the training system. Briefly, the reason for this is that unit training (through the ARTEP) is presently related to large segments of performance (such as the team activity between receipt of a fire order and firing). While this provides an "ultimate" performance criterion, it does not always provide segments and measures of performance that are useful in training. Fully effective training requires the diagnosis of performance to establish training need and the evaluation of performance to assess training effectiveness. Both diagnosis and evaluation require performance definitions and measures at a finer level of detail than is given in the typical ARTEP statement. The earlier analyses identified team-members' performance at the appropriate level of detail, and the Gunnery Team Trainer specification is premised on the collection and use of such performance data. The GTT, then, also serves as a performance data collection means. With this characteristic in mind, it was accepted that one GTT objective would be to implement a performance data collection function for application in other areas of performance research.

# B. Scope of Task Four

Task Four encompasses all of the synthesis and integration needed to combine the previous analytical results into a system for training. The content

of that system is comprised of the skills and knowledge needed by the gunnery team in performing the Engage segment of a Field Artillery indirect fire mission. The training system is to be performance based. It is to make the most appropriate use of training devices and simulations. Especially, it is to make use of current and emerging Field Artillery devices. In Task Four, the specification of devices and simulations is based first on the training effectiveness of such synthetic means. Second, the choice of devices and simulations, as well as the overall training system specification, is based on the conservation of scarce/costly training resources.

The scope of Task Four was never defined solely in terms of the amount of synthetic means to be used. It was not, for instance, defined as a totally synthetic (or surrogate) system. This aspect of scope was always defined to be the "appropriate amount" of synthetic training to meet the identified needs in the specific subject matter.

Finally, the scope of this task encompasses not only the derivation of a functional description of the GTT but also includes guidance for the use of the trainer. There is a description of how the GTT would be initialized and operated by the using unit. This guidance represents the "tailoring" or adaptation of the system's capability to each unit's needs. In addition, it is suggested that the exercise of representative fire missions be used as the basis for team training. The guidance in that regard consists of a set of descriptions of five representative missions. These consist of a mission narrative, a flow diagram depicting the functional and sequential relationships among all of the team's tasks, and the performance data that have been derived for each of the tasks.

#### C. Method

Task Four consists of five steps, each one of which represents a compilation of selected analysis results and the application of training expertise. There is a specific product from each step; these products taken together represent the full output of the task. The steps are illustrated in the flow diagram shown in Figure 2. The diagram also depicts the flow of input from the earlier program tasks.

#### 1. Deriving System Requirements

As shown in the diagram, the derivation of GTT system requirements and the definition of a GTT concept were carried out essentially in parallel. Also, these steps were initiated early in the task. The system requirements which establish what is to be trained in the GTT are derived basically from the task descriptions compiled in Task One and the performance data produced in Task Two. More directly, these requirements are also derived from the so-called aggregated tasks that were produced in Task Three. These aggregated tasks are discussed in the third task report and elsewhere in this report. Briefly, for the purpose of this discussion, the aggregated task is a compilation of the detailed analysis results to produce a single performance statement concerning the same equipment and/or procedures within each section. For example, the use of the FIST Digital Message Devices (DMD) is an aggregated task from the several mission-specific uses of the DMD shown in the

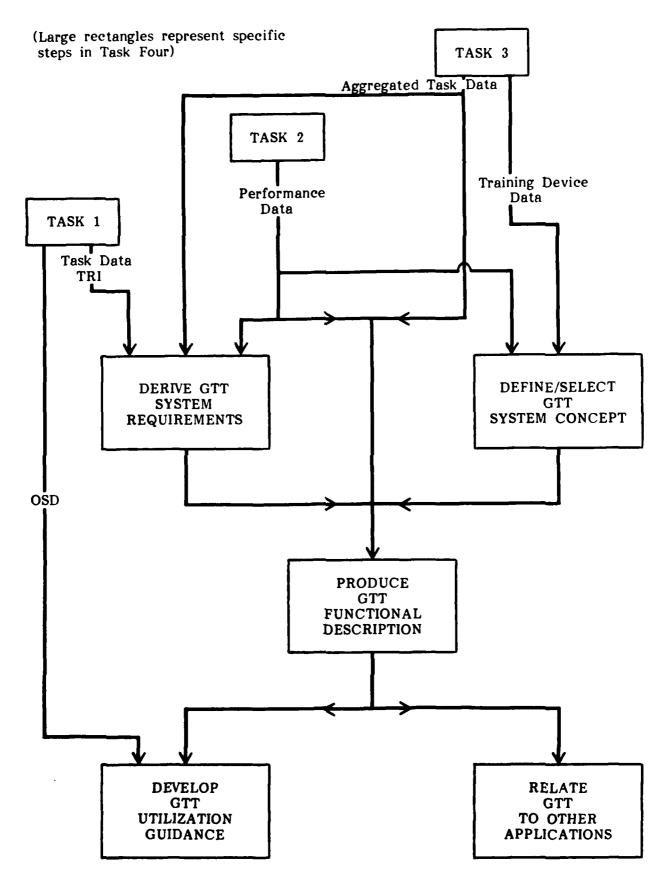


Figure 2. Flow Diagram of Task Four

analysis. This aggregated task then becomes a requirement for training. Throughout the earlier analysis the several specific applications of the DMD were considered at each analytical level. In that way, the required performance and performance measures were readily identified and confirmed. Now, in dealing with a system for training, it is more efficient to think about the broader statement of the need for training the use of the DMD. The context of a specific mission application is introduced by the way in which the GTT is used (see Section VII, Utilization). The training requirement is simply to train FIST personnel to use the DMD at levels of performance derived from the analysis results (e.g., the most demanding levels of speed and accuracy or some representative levels).

In effect, then, the aggregated tasks become the basic training requirements of the GTT. The GTT system must, to illustrate, train FIST personnel to use the FIST DMD to prepare, transmit and receive fire mission The specific information about conditions of performance and performance measures is derived from the task data and IPO data generated in the first two program tasks. But, at the level of a system requirement, the aggregated tasks serve to help establish the system functional description. is noted in Figure 2 that the Training Requirements Index or TRI is an input to the derivation of system requirements. While this is true, the TRI has not proven to be as potent or as useful as the original concept of the index suggested. There is a discussion of the TRI in Section VIII of this report. In the context of setting system requirements, the TRI only indicates that each of the aggregated tasks merits training resource expenditure. The differential rate of expenditure among the several tasks is not indicated decisively by the TRI. In fact, such differences can be established through a consideration of the essential characteristics of each aggregated task: fixed vs. variable, cognitive vs. motor, etc. The relationship of these characteristics to the GTT system concept is discussed in Section IV, GTT System Concept, under the heading of Trainee Interface.

#### 2. Defining a System Concept

The process of defining or selecting a training system concept involves an understanding of the training process, itself, as well as the integration of analytical data as shown in Figure 2. The definition of the GTT concept began very early in the program and progressed iteratively to the concept that is presented in this report. The inherent characteristics of a gunnery team training system were identified in general terms at the outset of the program and were established more precisely as the program progressed. These characteristics were then examined from the viewpoint of good training practices and the state of training technology so that a set of appropriate, essential characteristics was developed. These concern such issues as the use of simulation, fidelity of simulation, performance measurement, etc. Next, these characteristics were reviewed as to the underlying purposes of controlling training resource expenditures and conserving resources. Finally, the analysis results concerning gunnery team tasks and training device/simulation assessment were combined with the essential system characteristics to evolve an approach or concept for the GTT. The concept was then represented and described as a set of equipment and procedures that, when implemented, would provide effective gunnery team training.

## 3. Producing a Functional Description

The functional description is essentially a Type A Specification that describes what the GTT is intended to train and what are its functions. This description is a compilation and presentation of all of the functions to be performed by each GTT component identified in the concept. This "A Spec" provides the basis for engineering development and production of a GTT but is, itself, only a functional description. Because the concept includes currently operational equipment as well as adaptations of existing or emerging Field Artillery training devices, part of the functional description represents existing equipment and procedures. The Firing Battery Trainer (FBT) is an example of existing equipment included within the concept. Other components, such as the Forward Observer simulator, are at only a conceptual level.

## 4. Developing Utilization Guidance

This part of Task Four represents essentially a translation of established unit training procedures and needs into the GTT concept of a performance-based system of training making use of simulation. In a sense, the utilization guidance developed here is a reflection of the traditional Army approach to unit training and readiness assessment that is contained in the Army Readiness and Training Evaluation Program manuals (ARTEP). The process of developing utilization guidance was directed toward providing an overall framework of GTT use within which the person responsible for a unit's training can develop a specific program to meet that unit's needs. There is no intent to preempt the role of the trainer (instructor) in planning and conducting training that is tailored to the status and needs of the unit. It is, in fact, intended that the guidance given here will facilitate the "tailoring" process and encourage the responsible person to perform that vital process with even more diligence than might now be applied.

# 5. Identifying Other Applications

The focus of this entire program has been on unit training with simulation to control resource expenditures. The system that has emerged, the Gunnery Team Trainer, can perform that role effectively. The GTT, since it will identify and collect a large amount of performance data, can be thought of as a data collection medium. Thus, the GTT could serve other research and development applications that make use of such data. Also, the performance-based approach to training can be applied in other settings. The GTT is intended to reduce the need for live-firing but firing exercises (FTX) will continue to be held and parts of the GTT can be employed to score and record FTX performance. The possible extended applications are presented in Section VIII, Discussion.

#### IV. GTT SYSTEM CONCEPT

## A. Selection of a System Concept

The essential objective of the many activities within this research program has been the development of a description of a system for training the gunnery team at the unit-level in the skills and tasks that make up the target engagement process. Such a description is intended to be useful in itself as a basis for implementing unit training for the baseline and closely similar cannon systems. In addition, it is intended to serve as a model for any artillery training system. Finally, it will serve to illustrate the analytical techniques that were used for possible application to other Field Artillery activities concerned with Soldiers Tasks or with system development. This section of the report describes the selection of a concept for the training system and describes the system at a functional specification level.

Virtually all of the program activities to this point have been devoted to the analysis of the baseline system and the development of training implications for the training system. The concentration of these activities has been very largely on training content: what are the processes to be trained, what performance should be obtained, how can that be measured and what are the training-relevant characteristics of the tasks and processes. The analyses have, in other words, produced the information from which training objectives can be created. These analyses, as has been noted earlier, followed traditional training development practices. The outcome is a statement of what is to be trained. In order, however, to produce a description of a system for training, it is necessary to determine how that content is to be trained. The issue of how to implement the required training must be addressed. To define the implementation requires that several other factors be considered. The factors that relate to training device and simulation feasibility and appropriateness are probably the most important for this program. But, one other important factor to be considered, even though it has not been explicitly articulated in this program, has to do with the purpose of the training system. statement of purpose sets a context for considering all other factors, it will be discussed first.

# 1. Purpose of the Training System

The essential purpose of this system is to develop and improve the skills, knowledge and attitudes necessary for the successful performance of the gunnery team in target engagement. The system is to function at the unit level and is concerned with the integrated performance of the team as it will function in combat. Every aspect of this purpose has some effect on the selection of a training system concept or approach. Each of these will be considered below, but, first, consideration must be given to the fact that this is a system for training. The significance of that fact is that to accomplish training a system must provide effective media or presentation, it must define the behavioral outcomes of training in terms of operational performance and it must provide a context for the instructor-trainee transactions that will facilitate and enhance the learning process.

These comments are made here to establish the need for giving attention to training technology in the specification of this system. Very often, it appears, processes and equipment have been designated as training systems or devices when all that they provide is a means for rehearsal or practice. In an earlier part of the program, the current inventory of FA training devices was reviewed. These devices shared the characteristic of providing practice with little or no provision for measuring and evaluating performance. notable exception among current devices and approaches is the Closed Loop Training Concept. That concept includes the means for the gunnery team to practice a complete mission, but most importantly there is a definition and measurement of certain performance elements. The inclusion of the Firing Battery Trainer (FBT) in that concept indicates the development of a training The FBT measures and records elements of the Howitzer Section's performance, thereby implementing the critical training functions of diagnosis and evaluation.

This concern for performance definition and measurement is reflected in the GTT concept. The performance elements are defined in the analysis results on which the GTT concept is based. Further, the GTT includes a processor as a means for collecting actual trainee performance data and comparing that to the required or ordered performance. For example, the azimuth and deflection as set into the howitzer will be sensed and compared to the values in the gun order. In implementation, the "processor" function may be accomplished by automatic or manual means or by some combination. The exact means will be determined by many factors, such as feasibility and cost of direct sensing, rate and frequency at which data will be obtained and the utility of the data for immediate feedback. Conceptually, it is sufficient to establish the need for a "processor" function.

Finally, as regards performance, the GTT concept provides for the presentation of performance data to instructors who are responsible for the conduct of training. How this is implemented also depends on factors such as those noted above. The GTT must provide for the performance data to be available for use directly in training or in subsequent evaluation. (The issue of where data are used in the training process is addressed further in Section VII, Utilization.) The GTT concept also includes provision for recording performance data not only for crew training, but for evaluation and possible revision of the GTT, itself.

In summary, the GTT concept is strongly performance-oriented. The training objectives will be performance-based, and performance measures and criteria will be used in the conduct and evaluation of training. A combination of operational equipment and simulations has been determined to be the most appropriate training medium. This medium also allows for reasonable conservation and control of training resource expenditure. These attributes identify the GTT as a system for training. There is an additional characteristic defined in the GTT purpose that affects its training use: it is intended to be used in unit-level training. This is defined as training accomplished by an operational unit to maintain proficiency and readiness in its assigned mission. The implications of this are:

o Trainees, i.e., the gunnery team are qualified in their own MOS.

- o The system/equipment must L. switable for/accessible to use in garrison.
- o Individual task training is not a primary function of the system, but it should be feasible.

The fact that the GTT is a system for training, one in which skill and knowledge levels can be sustained and increased, is basic and critical to the definition of a system concept. There are, however, a number of other considerations that shape the GTT concept. The next one to be discussed has to do with Training Fidelity or realism in training.

## 2. Training Fidelity

To begin, the issue of fidelity in training has to do with the amount of realism that is introduced into a training system. Flight simulators used in pilot training are highly realistic in presenting environmental and operational conditions. They offer a high degree of fidelity. For some training, such as automobile driving, training takes place under actual operating conditions and thus has virtually complete fidelity. There are two aspects of fidelity: the The former which has to do with the physical and the operational. representations of the environment and equipment and is relatively easy to conceptualize; physical simulation is often the goal in designing a training system because it is so easy to comprehend and usually can be achieved. Physical simulation, however, may not be necessary in training; simply mimicking the appearance, and perhaps some of the functions, does not insure that there will be positive transfer from such a "realistic" training system to the operational system. For training, the critical aspect of simulation is that it be operationally realistic. The training system must provide for the same human functions, the same inputs, processing and outputs, as required in the When this is achieved, the probability of positive transfer is increased. So, in the specification of a training system, the basic concern regarding fidelity has to do with the operations that will be performed by the There must be realistic approximations of the required tasks, or the tasks themselves. In the proposed system, the gunnery crew will be required to perform their actual tasks, for the most part, but some--notably the observers' tasks--will be simulated.

In this discussion of fidelity, the focus has been on task training and the conclusion was reached that operational realism is the essential ingredient for such training. The role of total, physical simulation in the training process changes, however, with changes in the level of training. In general, as the skill level of the trainees advances, physical realism contributes more to the successful outcome of training. Once the requisite skills have been acquired, training emphasis is on the application of the skills in an operational setting. This aspect of realism is noted in a military human engineering handbook (5) Chapter 14. Also, in a review of literature performed by ARI (6), it is noted that in team training it is desirable to "learn by doing in a combat-like environment" (p. 310). The team members having been trained in the individual tasks need to learn the team activities in a realistic environment. Along with skill level, the value of realism changes with the amount of group or team interaction. A high degree of physical realism appears to facilitate training in team or collective tasks more than in individual tasks. The above ARI review makes a conclusion that military teams should be trained in conditions that approximate those in which they will be expected to perform.

It should be noted that these indications of increased value of fidelity in more advanced and collective training may in part be artifactual. It has been observed that in early stages of training--when a skill is just being acquired, physical realism may be an interference in the learning process. This effect is suggested in a study of pilots learning to fly holding-patterns (7) where a computer-based procedural trainer led to more accurate patterns in a criterion flight than did actual flight training. It was suggested that the competing demands of instruments might interfere with learning the pattern flight procedures. If that interference with early skill training really exists, then it may be that for the more advanced skill levels (such as will be found in unit training of the gunnery team), there is simply no effect. Since it has not been a requirement of this program to do an extensive training literature review, clear evidence for or against this possible artifact cannot be adduced. It does appear, however, that the sense of the literature does support the positive benefit of realism for advanced and collective training. certainly no question that realism tends to increase motivation and is related to confident, positive attitudes about training results. One FA study (8) notes synthetic training was at least equal to training with real equipment when measured by live-firing results. However, there was greater self confidence and a more positive attitude expressed by the persons who trained with actual equipment, i.e., with complete realism. In addition, there is a large amount of literature--anecdotal as well as technical--attesting to the motivational effects of aircraft and other vehicle simulators. Perhaps of equal importance for this program to any of the above, is the fact that the Field Artillery has undertaken many training device and simulation studies and each of these has been marked by a strong concern for realism. It has been noted earlier that many of these devices are deficient from a training viewpoint in that performance definition and measurement is lacking. In spite of that, the attempt for realism marks these products as potentially valuable training tools and underscores the value of realism as already recognized by the artillery.

The GTT, therefore, is defined to strive for a high degree of realism in training. The use of operational equipment, in addition to satisfying the training media assessment noted in the previous section, provides a substantial degree of physical realism. Likewise, basing training on actual fire mission procedures adds to the operational realism. Environmental realism—physical or operational—is not systematically provided in the GTT. Some degree of realism for a range of physical environments can be achieved by scheduling the use of the trainer to encounter a variety of conditions. Operational realism—live fire, battle stress, etc.—is difficult to achieve and costly. It is judged to be inappropriate to attempt that degree of realism in unit training. Such realism can be experienced in live fire exercises in combined arms training.

The issue of fidelity in training must also be considered in terms of the potential that any synthetic means would have for training the gunnery team.

A study for the U.S. Navy (9) compared computer-based training (CBT) to traditional classroom and hands-on training of performance skills. The skills are those used by a co-pilot to operate an ASW system operational panel which includes a situation display, a track ball and variable function push buttons. The CBT provided a graphic representation of the panel that was programmed to respond interactively to the trainee's input and control. The

CBT was characterized as being high in operational fidelity, but low in appearance fidelity. Performance of the CBT trained and the traditionally trained subjects was measured on a high fidelity simulator used for co-pilot position training. The CBT group was faster and completed more tasks (in the simulator) than did the traditionally trained group. A similar finding occurred in an FA study already noted (8) which indicated equivalent performance between two groups of gunners: one having trained on actual equipment and one on a training device. A number of studies report similar findings. It must be observed, however, that most of these studies relate to skill training—often relatively simple skills—and they do not typically include team performance. There is, then, a basis for using a completely synthetic approach to skill training. However, there appears to be little justification for generalizing these results to gunnery team training.

The point of view that only actual live-firing can provide adequate training is one that has been expressed usually by operational personnel who might be considered "traditionalists." However, there is also support or at least partial support for this view in the training research literature. The ARI review noted earlier (6) suggests that training must be performed under realistic combat conditions which implies the use of operational equipment. number of studies report improved trainee attitude or confidence as a result of using operational equipment in training. Overall, there appears to be some support for the use of real equipment in realistic settings. For this program, however, the decision about using operational equipment for training hinges on two points other than specific training utility. First, the largest of the actual equipment in an artillery system, the howitzer and its support vehicles, would be difficult and expensive to represent in physical fidelity. So, unless it could be shown that part-task devices or some form of computer-based training could be used to implement unit training, the development of surrogates for the howitzer is judged impractical. Also, the possibility of establishing gunnery team training on part-task trainers or on CBT using graphic representations for performance tasks must be judged remote. This is only to say that given the present state of training technology and the analyzed needs of the artillery, the two mentioned approaches are not appropriate. It is clearly true that training technologies are developing in both capacity and sophistication and in the future this position might well be changed. The possible application should not be abandoned, it is just not appropriate now.

Extensive use of synthetic training is not indicated for the GTT at this time. The procedural, equipment-related tasks are most effectively trained (at the unit level) on the actual equipment. (A requirement for augmenting that equipment with performance-measuring devices is presented in Paragraph 4, below.) Further, the development of physical simulations of artillery hardware is judged to be too costly for practical implementation. In addition, the use of surrogates, such as a computer-based training approach, has not been shown to be appropriate for team training at the unit level. However, simulation is needed to represent the process and effects of live firing. Also, as will be discussed below, there is a special need for simulation to provide adequate observer training. In summary, simulation is needed to avoid the expenditure of resources in moving to remote, safe ranges and in firing full rounds. The further need for simulation of FIST/FO functions is presented next.

#### 3. FIST/FO Considerations

A major emphasis of this program is on gunnery team training. The contractual description of the program refers to the integrated functions and tasks performed by the three subsystems, i.e., Howitzer Section, Fire Direction Center and the FIST including the FO. There is an impediment to such training in that the FIST and FO are attached to the supported maneuver unit and are not a part of the artillery battery. Thus, unit-level training of the whole team will require coordination between the artillery and the maneuver units.

Further, unit training will often be conducted at the battery level and may even involve single platoons. The importance of this is that in any given unit training exercise only a few observers will be required. This fact, combined with the emphasis on realism in unit training, suggests an observer component that can be operated in a field setting for two or, at most, a few observers. Such a facility could be emplaced at a realistically remote location from the FDC and howitzers. Since the GTT concept does not encompass live firing and because it will be advantageous to allow training in a variety of environments, the need for simulation of environment and targets for the observer is clearly established.

Simulation for the observer function is not an easy task. The observer's perceptual activities involve detecting, locating and identifying targets in natural terrain. The targets may be camouflaged and may be at ranges that result in very small, apparent images; they may be moving or stationary. If moving, they will take advantage of any cover to avoid detection. This is clearly a difficult task; yet it is critical to the success of a mission, for without this task the indirect artillery fire process cannot be started. Since it is assumed that the tool skills of map reading, searching for targets, detecting evasive or hidden targets, etc., will have been taught in MOS training, the job of unit training must be to maintain these skills and enhance them through exposure to increasingly difficult problems. The obvious conclusion from the above is that the GTT concept must include simulation of terrain and targets that has extremely high fidelity and allows for precise registration among the target, the terrain and the impact.

The observer function includes a further cognitive activity in which the target is identified and located relative to a map and/or a target list. The effect of this on the concept of an observer simulator is to emphasize the need for precision and accuracy of representation. This will provide the basis for accurate evaluation of the total observer job. At the present time, the observer function in the team context is addressed by only one Field Artillery Device: the Training Set Forward Observer (TSFO). It serves both as an entry-level trainer in the Field Artillery school and as a unit-level trainer in the Closed Loop Training Concept (CLTC). While the TSFO has been judged to provide "fair" to "good" training of the observer function in Task Three of this program (3), it does have shortcomings when looked at as a component in a realistic team training system. In its present configuration, it is a school-type trainer accommodating up to 30 observer-trainees in a permanent building. It does not provide for environmental exposure (of the observer). The TSFO targets--in the judgment of subject matter experts at Fort Sill--are not at all realistic: they appear as white silhouettes. The system for gunnery team

training must be defined to include a simulation that provides a realistic setting for the observer function including environmental features as well as realistic representations of targets and impact effects. The GTT will attempt to provide for observer performance in an environment as might be encountered in actual operations. This part of the GTT may be similar in concept to the Guard Fist II which is a device in conceptual development by the National Guard Bureau with USAFAS support. The observer component, in summary, will provide a compact yet accurate and precise presentation of physical environments and targets. It will, if possible, function in a field setting and will permit the connection among the sensors and processes in the GTT. It will provide performance measurement relative to the simulated target position and other characteristics. The measurement of performance as it relates to the GTT is discussed next.

#### 4. Performance Measurement

Training is a process in which a trainee achieves the skill and knowledge needed to perform a job in a specified way. Training, therefore, should be defined in terms of performance-based objectives. In this program, the analysis of input-process-output (IPO) of each baseline system task identified the expected job performance as well as the means for measuring (observing) it. This program thereby created a data base from which appropriate, performance-based training objectives can be derived.

These statements about the role of performance definition and measurement in training might appear to be statements of the obvious, but practical experience as well as systematic research indicate otherwise. Training media and even systems of training are frequently developed to provide some facility for training without explicit information about what is to be trained. For example, a mock-up or simulation of a piece of equipment might be produced as a training aid or device yet not be documented as to the behavior that the trainee should learn or how it can be observed (measured) or what constitutes desired performance. In an earlier part of this program, the Field Artillery training devices that were reviewed seemed designed to allow practice but with little, if any, definition of the task to be learned or of how to measure the success of training. It is not an overstatement to say that the definition and measurement of performance is a principal basis, if not the single most important one, for developing a training system. In the GTT, there will be provision for measurement of performance within each task as well as of the team performance.

The value of measurement in training is enhanced when the performance data are available for prompt feedback to the trainee. In the ARI literature review already cited (6), it is noted as one major recommendation for team training: "Team members should receive performance feedback." (p. 311) The discussion of this finding goes on to say that the feedback should be in terms of the required team and individual performance. To increase the value of measurement still more, it would be desirable to provide feedback automatically during the training process as well as in debriefing after training. The GTT will provide for in-process feedback, to the extent feasible, and will record measures for instructor debriefing following an exercise.

During the course of this program, there have been questions raised about the utility in unit training of the identified performance measures. There

are apparently two concerns: first, that the measures are too finely divided and, second, that the only measure of interest is impact on the target. The first issue can be illustrated by the task, "Set/Lay the Howitzer for Quadrant (RQ)." In the IPO analysis, that task was segmented into 11 elements and a performance criterion was identified for each element. Unquestionably, this amount of detail exceeds practical application in a team training situation. Unit-level training, however, must also accommodate remedial and cross-training in both of which there is a need for the details of performance. In the proposed system concept, provision will be made for a combination of detailed and inclusive measures.

The second comment made about performance measures which suggests that only the ultimate measure of "did hit" is important appears to be made outside the context of training. There is validity in the idea that what really counts is to hit the target, but to develop a team that can do that repeatedly with good reliability, each member of the team must be trained and evaluated in the details of each of his tasks which requires the fine-grained measures. Also, the team performance must be evaluated at the section level to diagnose both training needs and training success. Again, measures at a lower level than the all encompassing "did hit" are needed. The GTT concept includes both individual and section performance measures. Some of the higher level measures, including the ultimate effect on target, suggests a concern for readiness assessment. Because the GTT will include these measures, it may be considered to have an application as a readiness-measuring device. Such additional uses of the GTT are noted in the next section.

# 5. Other Applications

The immediately obvious additional application of the gunnery team training system is in readiness assessment, which is effectively an outcome of the training process. It is in part for this potential use that training sequences based on actual fire missions have been proposed. These sequences (which have been documented in operational sequence diagrams) do represent the ultimate goal of gunnery team training but they also represent sequences that are critical for readiness assessment in the ARTEP (10). The ARTEP manual describes five mission sequences for which readiness should be demonstrated. The proposed training sequences consist of two Adjust Fire Missions--autonomous and non-autonomous; the Precision Registration Mission; a Fire for Effect Mission; and a Copperhead Mission. These five sequences encompass all of the fire mission tasks and procedures associated with the baseline system. Thus, there is a sound basis for defining a readiness role for the GTT.

The second possible application of the GTT is as a research vehicle. The technology underlying the Field Artillery continues to grow with improvements in data processing and communication and with improvements and innovations in ammunition and in delivery techniques. Throughout this growth and change, the presence of human operators will be continued. The role of the artilleryman in new or modified weapon systems and the measurement of performance are two areas that would be well served by a system that provides a research base for the manipulation and measurement of crew activity. Even for current systems, the effects of training, selection, crew composition, etc., could be examined with the proposed system as a research tool. This issue is addressed more fully in a later section of this report.

The above completes the presentation of factors beyond the analytical results that have been considered in the development of a concept for the gunnery team training system. The process of integrating all of these factors into a concept definition is not a single discrete step, but has taken place throughout the program. It has been an iterative process of combining the system purpose, the training content and the review of devices into a structure that is responsive to the original goals of:

- o Unit training effectiveness
- o Resource expense containment
- o Systematic derivation of training needs

In the following section of this report, the GTT concept is described.

# B. GTT System Concept

#### 1. Overview

Figure 3 is a functional block diagram of the GTT. Three of the basic, most significant facets of the system concept can readily be seen in that diagram:

- o The trainee interface with GTT is accomplished through operational equipment.
- o Currently available and emerging Field Artillery training devices are the basis for the required simulations.
- o The function flow represents an integration of all team members.

Each of these is discussed below.

#### a. Trainee Interface

In general, the interface between GTT and each member of the gunnery team is through the operational equipment normally used by the trainee. The exceptions to this are that the Howitzer Section will use a shootable practice round with simulated recoil and the observers will use a video presentation of terrain, targets and impacts. Further, the implementation of the observer simulator may require some special tools or techniques for viewing, such as binoculars with specially scaled optics. However carefully that kind of adaptation is designed, the observer will not be performing in a totally realistic way.

The rationale for structuring the GTT around operational equipment includes two considerations. First, because the tasks in the Howitzer Section and in the FDC are largely "fixed," that is, tasks that reflect a procedure for equipment operation, they are most efficiently trained using

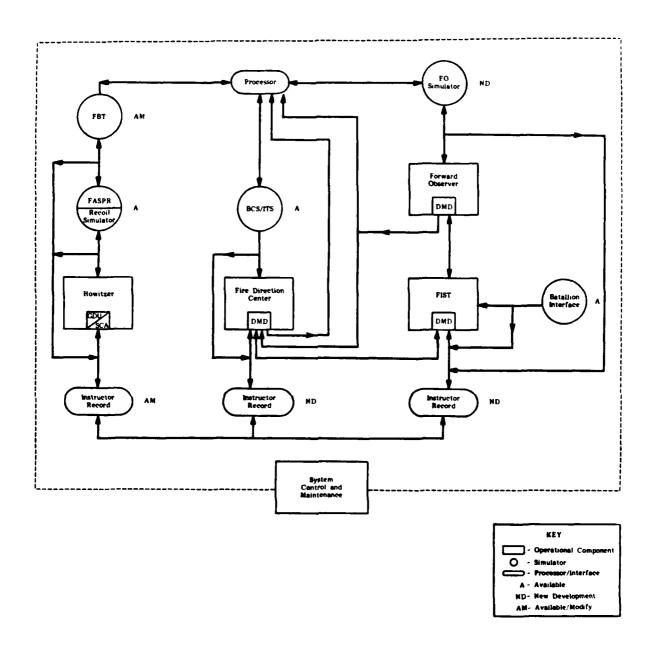


Figure 3. GTT Functional Block Diagram

actual equipment.\* Not only is this approach consonant with good training practices, it also follows the results of the assessment of training media done earlier in this study based on the practical experience of the program staff. Finally, as regards these procedural or fixed tasks, the use of operational equipment coincides with a widely held attitude in the Artillery that favors "hands-on" training. While this attitude cannot be validly generalized to all training, it is certainly valid for the gunnery team.

The second basis for using operational equipment is closely allied to the first. It is that operational equipment provides a high degree of realism. Because it is team training and because it is for sustainment of proficiency, the GTT is made more effective through realism. (See preceding discussion of Fidelity, p. 19.) Because the GTT concept includes a shootable practice round with a limited range (about 200 meters), it is expected that a safe firing area can be readily located on almost any facility housing an artillery unit. Therefore, it is judged that operating costs, primarily fuel, projectile and propellant, will be at a minimum. The value of the realistic, hands-on training will prove to be worth such operating costs.

## b. Existing/Planned Devices

Figure 3 shows the application of five devices that are currently in the Field Artillery inventory or are under development. In the Howitzer Section, the GTT concept includes the Firing Battery Trainer (FBT), the Field Artillery Shootable Practice Round (FASPR) and the Recoil Simulator. None of these is yet fully fielded, but all have been demonstrated and contribute to the objectives of the GTT. The FBT provides the means of detecting and measuring performance at the howitzer. It also provides for transmitting and recording performance. This implements the required measurement and feedback (short- and long-term) of trainee performance. The FASPR and the Recoil Simulator provide for a high degree of realism in munitions handling and firing. The FASPR, however, is propelled no more than 200 meters down range and is recoverable and reusable. Thus, the desired realism is achieved with only limited munitions cost and very modest space requirements.

There is indicated in the GTT a Forward Observer (FO) simulator that is defined functionally to provide terrain, target and burst representations for the FO. This combines elements of the current Training Set Forward Observer (TSFO) and its link to the FBT with elements of the Guard Fist II. The critical features to be provided by these devices are fidelity of representation (through the Guard Fist II video concept) and the determination of burst location as provided by the FBT/TSFO link. The concept includes two input sources that appear to be required for the GTT to function as described. One is at the FDC and is defined as a means of providing digital input to the BCS. This appears to be an adaptation of the current BCS Interface Training

<sup>\*</sup>It should be remembered that what is addressed here is unit training to maintain and improve proficiency. The basic proficiency will have been achieved in school training leading to the award of an MOS. At that basic level, surrogate devices and procedures may be useful to attain proficiency. For the unit level, actual equipment is a more effective medium.

Simulator. A similar adaptation appears to be required at the Fire Support Team (FIST) to represent battalion/maneuver unit input to the FIST.

The essential reason for incorporating these devices is one of economy or conservation. This program began at a time when many of these Field Artillery devices and concepts had advanced to actual testing and field use or were at least well defined and well thought-out concepts. To overlook these developments and propose new but similar approaches would at best be wasteful. Perhaps the most significant reason for incorporating these devices is that they each represent an Artillery solution to an Artillery problem which generates confidence that they are both usable and effective. The training technology deficiencies noted earlier in this program (lack of performance definition and measurement, mostly) are overcome in the incorporation into the GTT.

## c. Integrated Performance

The GTT concept is based on the premise that the training to be accomplished is that of the integrated performance of the gunnery team. functional block diagram illustrates this in the flow of information depicted among the three parts of the team. This is not only in response to the statement of work which stipulates "integrated team activity." Is is, more importantly, in response to the definition of the team, itself, which (briefly) is that the team performs all of the functions required to complete an indirect fire To do that requires the mutual working together of the three mission. subsystems and the flow of target information from the observer (or other source) through the FDC to the howitzer and finally the flow of similar impact information: observer to FDC to howitzer. What is referred to here as integrated performance is quite similar to the Closed Loop Training Concept (CLTC) that has been demonstrated by the USAFAS and the U.S. Army Human Engineering Laboratory (HEL). The differences or similarities between the two approaches need not be emphasized. Both approaches implement the complete circuit of information beginning with target acquisition and proceeding through technical fire direction, firing, impact evaluation, and adjustment. The GTT approach is focused on performance-based training requirements and measurement and is especially adapted to unit training. Those features represent the objectives set forth for the GTT and they have been met in this concept.

# 2. System Control, Management and Maintenance

The GTT concept attempts to establish a trainer that is fully responsive to the requirements of training technology and the needs of the unit. To that end, the concept includes provision for up to three trainers—instructors—each of whom is responsible for one subsystem. These instructors control the GTT, and take part in its management. There are a few aspects of this that merit further consideration.

The GTT is intended for training and since it is not a self-instructional medium or an automatic one, instructors are needed. These instructors will be expected to meet traditional Army requirements. That is, that they are subject matter experts (SMEs) with regard to the subsystem for which they are responsible, and they will be qualified as instructors. Importantly, for unit training it is expected that the instructors will not be

performing that function in addition to being part of the team. It is suggested in some Army literature that a Section Chief will be responsible for training while performing as chief. This detracts from both jobs and certainly limits the effectiveness of feedback, diagnosis and training supervision. These critical functions can only be performed by someone who is skilled in Army training and devotes full time to training duties for the duration of an exercise or drill. This is not to be taken as a requirement for the addition of an instructor position to each unit's complement. What is suggested is that personnel in each unit who are qualified in the Army training program be available for this The ARTEP manuals, for example the one applicable to the training duty. baseline system (10), state that the "leaders" shall be responsible for training the soldiers for whom they are responsible. Also, the manuals specify the commander's responsibility to plan for and provide training, including qualified trainers as one necessary resource. These principles are further elaborated in the series of Army Field Manual devoted to training (FM 25-1 through 4). Specific guidance for instructor preparation at the unit level is contained in FM 25-3.

As indicated in the Functional Block Diagram, the instructor control and management of the GTT will be implemented in three parts-one for each subsystem. This concept is not meant to imply the requirement for three physically distinct components. It may be implemented with a single instructor station to which will be transmitted the performance data compiled separately for each subsystem. The essential concept here is that qualified instructor control is needed and that data will be segregated by subsystem. The precise nature of implementing this must be determined in subsequent development.

There is a higher level of system control contained in the GTT concept. As a unit-level trainer, the GTT must allow for "tailoring" the content of training to the unit's needs. Basically, this requires that the GTT reflect the mission and the location of the unit. It is anticipated that this will be achieved by loading a number of parameters into the system uniquely for each unit. The most obvious, and perhaps most important, of these is terrain depiction. The Forward Observer Simulator will be loaded with appropriately designed discs (or other video input) to show the terrain in which the unit is located and/or will operate. Along with this, an appropriate set of targets (and tracks, for moving targets) will be loaded into the Processor and Forward Observer Simulator. Also, appropriate ammunition and ballistic data will be generated and loaded for use in the Battery Computer System (BCS) and in the GTT Processor. The Processor uses that information to generate impact data and input that to the Forward Observer Simulator.

One final aspect of management and control has to do with what has been designated "system maintenance." This concept is that the system, GTT, will compile performance continuously to provide a quantification of its application and its success. The performance data will be the same as or a summary of the performance data used in the training process. For system maintenance, however, the data will be used to evaluate GTT effectiveness: how much does team performance improve as a consequence of training? The data will likewise provide a basis for the analysis of GTT architecture by helping to assess the contribution of each part of the system to overall effectiveness. As presently thought of, the System Control and Maintenance

component will likely be implemented as a manual function supported by appropriate processor routines and outputs. The management and maintenance functions are not seen now as automatic or self-regulating.

In summary, the GTT concept envisages a system for training that is based on a high degree of realism in team training which is performance-based. To these ends, operational equipment is to be used, and operational fire mission procedures and tasks are to be the basis for training. Simulation is proposed to provide a realistic observer setting without deploying to field locations; reusable practice rounds permit the exercise of realistic howitzer procedures with a minimum expenditure of resources for moving to and setting upon a full firing range. Effective system control and management is provided through a combined manual/processor function. That latter function also provides for the monitoring, evaluation and refinement of the system. This concept allows for possible application of the GTT to other kinds of training as well as to research uses.

The specific system requirements, i.e., what the GTT is to train, are presented in the next section. A functional description of the GTT is presented in Section VI, and in Section VIII other possible applications of the GTT are presented.

# V. GTT SYSTEM REQUIREMENTS

#### A. Introduction

In Section IV, the GTT concept of a unit-level trainer, with operational interfaces among the FO/FIST, FDC and Howitzer Sections has been defined. The observer transmits fire orders; the direction center provides technical fire direction; the howitzer executes the ordered mission; and the observer monitors the effort and provides corrections. Both practice and diagnostic evaluation are called for in this concept.

Next, a summary of the specific system requirements is needed in preparation for defining functional specifications for the GTT. These system requirements are the basic definition of what it is the GTT will train. are broad statements of the behavior or performance that the team members will exhibit after successfully completing training. The system requirements are a form of training objective, but at a less detailed level than that at which objectives are traditionally stated. In this program the details of tasks to be trained, performance measures, criteria, etc., were developed in a set of thoroughgoing analyses. At the completion of that effort, all of the results were examined to identify team performance in a compact set of statements. Because the same gunnery team equipment and procedures are used in many operational settings, the analysis showed much repetition and redundancy. That duplication of information was removed and broader performance statements were compiled. Each is unique to a gunnery team section, to an equipment and to an operator procedure. These have been designated as "aggregated tasks." It was during Task Three of this program that these were developed and were then used in the assessment of training technology. A summary of the results of Task Three is attached to this report in Appendix C. Those summary tables should be referenced in connection with the following statement of GTT system requirements.

Before proceeding to the requirements, themselves, it is essential to remember that the GTT is a unit-level system and to be aware of the impact of this on system requirements. The statements of requirements say that the team will "use a piece of equipment to (for example) communicate." That format, while descriptive of the task, could be interpreted to mean that training from entry-level to a stated proficiency is the objective. In unit-level training, however, it is the case that the team is MOS-qualified and that the basic skills have already been achieved. What unit-level training does is to sustain and improve each basic skill and employ it in a team setting. Thus, while each requirement is, for convenience and understanding, stated as a basic task, the important implication is that unit training is for sustainment and for the integrated training of the team.

#### B. Requirements

The requirements are presented below, grouped separately for each section of the team. Reference is made to the location of the summary tables in Appendix C.

#### 1. FO/FIST Requirements

The aggregated FO/FIST Section tasks are summarized in Table 1 in Appendix C. There are six of these tasks to be trained in the team setting:

- a. Using the DMD and FIST DMD to prepare, transmit, receive and forward messages related to all fire missions.
- b. Using the GLLD to measure range and to illuminate targets; using on stationary or moving targets; using in daylight or nighttime operations.
- c. Using the LRF to measure range.
- d. Using visual/manual devices (map, plotting equipment, binoculars, compass) for: determining object location, altitude; recording data; drawing and using terrain sketch.
- e. Decision-making related to all fire missions, including: a) target detection, identification, classification, threat assessment and location relative to zone of responsibility; b) target selection, based on threats, priorities and commander's guidance; c) command fire to engage selected target (fire, adjust fire data); d) evaluate mission to determine call for further adjustment or EOM; and e) safe operating procedures.
- f. Timely operation under stated environmental conditions.

Regarding Task 1, the GTT should help train FO/FIST Section personnel in using DMD and FIST DMD communications to help carry out fire mission activities, including: request and adjust fire (indirect, area, suppressive, immediate suppressive, fire-for-effect, assault, destruct, illumination, smoke, creeping fire, final protective fire, irregularly shaped target, adjust by sound); receive messages for and report after determining direction and distance (registration points, targets including Copperhead, bursts, cloud height, impact and time registration); and control/coordinate FOs for conducting registration. Regarding Task 2, the GTT should help train the use of the G/VLLD to lase targets (moving and stationary under clear and limited visibility), to locate targets and bursts (high burst, request/adjust fire, cloud height; using grid, polar, known point methods), to designate targets during Copperhead engagements, and to conduct impact and time registration. Regarding Task 3, the GTT should help train the use of the LRF under normal and unusual conditions to measure range for cloud height, target location (grid or polar methods), to request/adjust fire (area, suppressive, immediate suppressive, fire-for-effect, destruct, assault, creeping, final protection fire, irregularly shaped target, smoke), to determine own location, and to conduct impact and time registration. Regarding Task 4, the GTT should help train FO/FIST personnel in using maps, plotting equipment, binoculars and compass to determine and record object locations (select target to be lased, select registration point, request/adjust fire, own location; using grid, polar, known point methods), to make a terrain sketch, to conduct impact and time registration, and to control/coordinate FOs for conducting registration. Regarding Task 5, the GTT should help train FO/FIST personnel in timely,

proper and safety-observant decision-making related to object assessment (targets, clouds, bursts, registration points), target selection for engagement (stationary and moving targets in clear and limited visibility conditions; for conventional and laser guided munitions), preparing fire commands (request/adjust fire) and the conduct of impact and time registration. Finally, Task 6 requires that all of the above activities be trained under the extreme environmental and operational constraints that may be encountered in wartime.

#### 2. FDC Requirements

The aggregated FDC Section tasks are summarized in Table 2 of Appendix C. There are four of these tasks to be trained in the team setting:

- a. Using BCS to process and evaluate RFAF (Autonomous) messages related to adjust fire, fire-for-effect, quick fire and Copperhead (target-of-opportunity) missions.
- b. Using BCS to process TACFIRE messages related to adjust fire, fire-for-effect, time on target and specified fire plan missions.
- c. Plotting/replotting targets on map, using BCS to receive and transmit related data.
- d. Timely operation under stated environmental conditions.

Regarding Task 1, the GTT should be employed to train FDC personnel in using the BCS for processing FO/FIST messages, for determining fire data (grid, polar, known point, specific shell/fuze, quick fire, illumination and Copperhead) and for deceiving the enemy. Regarding Task 2, the GTT should train them in using the BCS for processing TACFIRE fire plans, for determining fire data (grid, polar, known point, specific shell/fuze, time-on-target, and illumination) and for deceiving the enemy. Regarding Task 3, FDC personnel should be trained in plotting/announcing chart data, replotting targets, and using tactics to deceive the enemy, all with the aid of BCS communications. Finally, Task 4 requires that all of the above activities be trained under the extreme environmental and operational constraints that may be encountered in wartime.

#### 3. Howitzer Requirements

The aggregated Howitzer Section tasks are summarized in Table 3 of Appendix C. There are five of these to be trained in the team setting:

- a. Using GDU/SCA and/or voice to receive, announce and repeat communications related to all fire missions.
- b. Initiating, observing, evaluating and correcting operating procedures/conditions to insure safe handling and firing of the howitzer and ammunition.
- c. Aiming the howitzer in elevation and deflection, using the elevation quadrant/range quadrant/direct fire scope and the pantel/collimator, respectively.

- d. Loading, firing and clearing the howitzer.
- e. Timely operation under stated environmental conditions.

Regarding Task 1, the GTT should be used to train Howitzer Section personnel in using the GDU/SCA and voice communications to help carry out fire mission activities, including: prepare ammunition; set/lay for deflection; determine that the howitzer is safe to fire; set/lay quadrant (both Gunner's Quadrant and Range Quadrant); and load the howitzer. Regarding Task 2, it should help train the procedures and activities for insuring that the howitzer is safe to fire, including: prepare ammunition; identify/correct hazards and settings; load the howitzer; and take immediate corrective action for a misfire. Regarding Task 3, the GTT should help train the Howitzer Section in aiming procedures and activities, including: set/lay for deflection; and set/lay quadrant (using both the Gunner's Quadrant and Range Quadrant). Regarding Task 4, the GTT should help train the loading, firing and clearing activities, prepare ammunition; operate the howitzer loading and breech mechanism; fire safely as directed; and post-fire swab and clear the howitzer. Last, Task 5 requires that all of the above activities be trained under the extreme environmental and operational constraints that may be encountered in wartime.

The above summary of specific system training requirements is supplemented by other needs derived from the various analyses conducted during this program. Those needs, which have been accounted for earlier in this document, are: 1) to recognize psychological (motivational), sociological and political factors that can influence if and how the training system is used; 2) to overcome past tendencies to concentrate on the practice component and ignore the diagnostic evaluation/correction component of training; overcome past tendencies to develop training technologies that focus on isolated tasks of a single individual or Section, to the exclusion of interactive tasks involving the entire gunnery team; 4) to overcome inadequacies of typical training effectiveness measures and cost measures; 5) to provide more effective FO training in the tasks of detecting, locating, identifying and classifying targets under realistic wartime conditions (despite the commendable capabilities of the Training Set Fire Observation); and 6) to take advantage of other research findings that have significant implications for the initial acquisition and long-term retention of skills or knowledge.

The GTT System Concept and Requirements are next synthesized into a functional description that can be the basis for engineering design and development.

#### VI. GTT FUNCTIONAL DESCRIPTION

#### A. Introduction

The GTT concept is defined to provide effective training with reasonably low expenditure of resources. It establishes the system as being strongly performance-based and using operational equipment together with simulations that are practically immediately available. Realism is stressed through the use of actual fire mission procedures in training. Those procedures also implement the major unit-training purpose which is to exercise and perfect operational skills and procedures. Within this concept, the GTT must meet 15 specific system requirements. These are statements of the performance that the gunnery team must be able to demonstrate as a consequence of training.

To fulfill the requirements and the concept, it is proposed that the GTT will use a synthetic physical environment, including synthetic representation of targets. These will be inserted into the system by means of the observer simulator. In lieu of live firing, the howitzer will load and fire a practice round having a very restricted range. This will be supplemented, for realism, with a recoil simulator. The use of these simulations requires the development and use of synthetic ballistic and firing data. These data will be entered into the system through its Processor; the BCS Interface Training Simulator may also be used with the Processor.

With these simulations and synthetic data using actual communication equipment and links, it is possible to control the GTT in a realistic duplication of actual fire missions. In other words, the GTT will emulate a real fire mission. The complete fulfillment of training, however, requires two more capabilities: the GTT--through its processor--must calculate from the synthetic firing data the location of the impact (or burst) relative to the target and environment synthesized in the observer simulator. The second capability is to sense measures or indicators of performance and compare (or facilitate comparison) to criteria.

The implementation of the GTT system concept and requirements, which have been reviewed briefly here, imposes a number of functions to be included in the development of an actual GTT. These functions can be described most efficiently as a hierarchy of functional statements beginning with the most encompassing, "top level" functions.

#### B. GTT Top-level Functions

A top-level function is a statement of a function performed by the system (the GTT) as a whole in response to a single major system purpose or objective. A top-level function is implemented by the entire system: equipment, personnel and software. There are three top-level requirements related to the GTT:

o Provide unit-level training in support of the ARTEP for the gunnery team performing the mission segment, Engage.

- o Control the expenditure of training resources, especially conserving the scarce, expensive resources.
- o Control the system (GTT) in training application, and evaluate and improve its capability.

Each of these top-level requirements is discussed below.

#### 1. ARTEP Support

This function is the primary one performed by the GTT because it is the essential purpose of the GTT to provide the specified unit-level training, and because of this it must perform in the context established by the ARTEP. The ARTEP prescribes unit-level training and readiness assessment for all Army units based on the units' mission and equipment. For example, Manual 6-100 describes the ARTEP for the baseline system in this program. It is addressed to the Field Artillery Cannon Battery and specifies 13 Tables of Organization and Equipment (TOE) which include 105-, 155- and 203-mm howitzer batteries. Manual 6-100 states that, "This ARTEP is designed to give the FA cannon battery commander a collective training program." Thus, as a team (i.e., collective) trainer, the GTT represents one means for achieving part of that program. From this top-level function, several functions at the next lower level must be performed. These can be referred to as Tier One functions which are defined as functions that represent a part of the top level; that are definable entities (that is, they have a logical structure of inputprocess-output); and that are performed by one or more components of the system. The Tier One functions will be described following the discussion of the top-level functions.

#### 2. Expenditure Control

This second top-level function has to do with a basic purpose of this program, which is to control the expenditure of, and to conserve, training resources. The design of the GTT has been largely determined by this function. Like all top-level functions, this one involves all system elements, but it is particularly implemented through the simulations incorporated into the system. While the GTT is defined to avoid the excessive use of fuel and to minimize projectile- and propellant-related expenditures, it is only one tool for unit training. Overall, the final responsibility for conservation of resources belongs to the unit commander.

#### 3. GTT Control

This final top-level function represents the activities that are performed in applying the system to training, evaluating system performance, and planning and managing the growth and development of the system. The most significant aspect of this function is that it provides for system control during training. That is, the GTT is designed to implement good training practices: performance measurement, feedback, knowledge of performance, instructor control, a defined training procedure, etc. In addition, this top-level function provides "housekeeping." It implements the measurement and recording of system performance for evaluation and subsequent system growth and development.

#### C. Tier One Functions

These functions provide a greater level of detail in the description of the GTT. Since each involves only one or two GTT components, they are grouped here according to the most relevant component. The purpose of these functional statements is to serve as a basis for subsequent detailed design development. Generally, these functions do not describe a means of implementation. Since the GTT is based on available equipment—or equipment soon to be implemented—the means of implementation is usually clear. The parameters and performance measures associated with each function are not specified here. These values are better defined when the engineering design has led to specific means of implementation. A further comment on implementation is made at the end of this section.

#### 1. Observer Simulator Functions

The chief contribution of the Observer Simulator to the GTT is to provide a realistic environment for the FO in detecting, locating and identifying targets. This simulator then must provide the targets within the realistic environment. Further, because the GTT is to provide performance measurement, including total team performance, the Observer Simulator must be integrated with the howitzer so that bursts/impacts can also be simulated and fed back for adjustment and/or evaluation of performance. Since the location of unit training can be any place the artillery is located and since unit training may be used to anticipate moves to new locations, the Observer Simulator must be capable of being initialized for a variety of environments. Finally, the Observer Simulator must provide some means of adaptation to the apparent scale of whatever viewing mechanism is employed. If feasible, the device should also be adaptable for use with a GLLD training device. The specific Tier One functions required in the Observer Simulator are:

- a. Provide a number (TBD) of selectable or insertable visual environments that will approximate an observer's field of view and typical area of responsibility. An apparent size of approximately TBD meters wide is suggested, with a useful apparent range of TBD meters. The environments will include provision for simulating diurnal and seasonal changes.
- b. Provide realistic representation of targets with a selectable number and type to satisfy the needs of any unit's mission. Precision of location of fixed targets is ± 0, moving target tracks TBD.
- c. Provide realistic representation of impacts/bursts locatable to within ± (TBD) meters.
- d. Interface with the Processor to integrate the selected environment with the calculated burst/impact data. Information would flow to and from the processor for this integration.
- e. Provide a realistic field of view for one or two observers.

  Appropriate optical projection can achieve this; if any

compromise is required in the optical/viewing portion of the simulator, preference should be given to realism in the representation of environment and targets.

f. The augmentation of this simulator with appropriate sounds of incoming projectiles and burst or impact is desirable but is not judged to be essential.

It is anticipated that the Observer Simulator would be implemented as a video disc device similar to the proposed concept for Guard Fist II. Other reasonably precise means of depiction (of targets and environment) that are also capable of integrating target and impact locations precisely would be acceptable. The precision and fidelity of video disc representation are, however, well known, and in the course of this program there were several highly favorable comments received about the highly precise "locating" ability of the video disc technology. It is suggested that if the development of a GTT is pursued, the Guard Fist concept be reviewed and, if feasible, be incorporated in the GTT. Also, the support and guidance of the U.S. Army Training Support Center should be sought regarding video disc application.

#### 2. FIST/FO DMD

The Digital Message Devices (DMD) used by the Fire Support Team and the Forward Observer are the operational equipment, linked to the Fire Direction Center in the normal, operational way. Both the FIST and the FO will process messages in the prescribed manner for the fire mission being exercised. The data concerning target location and burst/impact location will be synthetic, but this fact is not apparent to the FIST members or the FO.

The Tier One functions associated with the DMDs are:

- o Compose and edit fire mission messages.
- o Transmit and receive messages.

These devices will function in exactly the same way as in an operational or live-firing setting. They are simply connected to the related operational equipment and then process messages in the usual way.

#### 3. Battalion Interface

In a real or simulated operational exercise, the Battery FIST receives target lists, planning information and guidance from Battalion. For the GTT, this input will be simulated. It is proposed on the basis of information available to this program that the Battalion interface can be accomplished through the concept of the Field Artillery School Fire Support Training System and/or the Artillery Control Environment. For the GTT, however, this simulated interface will be controlled through the GTT Processor. The only function provided by this component at the Tier One level is:

o Provide guidance planning and target data simulated from the Battalion level.

#### 4. GTT Processor

The processor in the GTT concept is the controlling element through which simulated parameters are entered and stored, performance measures translated among the several GTT elements, fire missions (or mission segments) selected for training, training and performance data collected and displayed, and appropriate firing tables and other synthetic data routed into the system. The GTT will provide for some number of selectable (insertable) physical environments, as well as a variety of target types and ammunition types. Associated with these parameters are some number of sets of ballistic and firing data to be used in technical fire control. These data must be stored and distributed from the processor. However, if these data are resident in the Battery Computer System Interface Simulator, the processor will perform only a "call up" and distribution function.

There is also a selection process within the conduct of training which arises from the GTT concept that allows team, section or individual training. Thus, the processor must implement this selection and control function. very significant functional area in the processor has to do with the instructor interface. The GTT concept requires instructor moderation in the planning, conduct and evaluation of training. This will be implemented with one or more interface stations using, most likely, an interactive visual display terminal along with a printer. That interface will allow the instructor to plan and initialize training, control the training process and receive performance and other training data. In this way, the instructor is enabled to provide on-line feedback to the trainees, as well as feedback subsequent to training (i.e., This interface also enables the control and monitoring of GTT The GTT flow diagram (Figure 3, page 26) indicates three such interfaces. Actually, these may be implemented as a single physical unit, but the control and monitoring functions will be segmented by subsystem.

There are altogether 13 separate Tier One level functions that must be performed in the processor. These functions implement the GTT concept, as described in the paragraphs just above. Figure 4 depicts the 13 functions in the approximate sequence in which they would occur during a fire mission training exercise. The functions are named in the boxes along the top of the figure. Beneath each function are listed the information items and/or GTT components that are affected by the function. While these are properly identified as "processor" functions, it should not be inferred that they are entirely automatic. It is more generally the case that these functions include both equipment/software processes and manual processes. The relevant information will be presented to the instructor, which is the "monitor" part of Then the "control" part will be performed--or at least these functions. initiated--by the instructor. At this stage of development, it is not possible to designate the allocation of each function any more precisely. The equipment and software capability that is available will largely determine that allocation. Also, of course, the inherent characteristics of each function will be considered in its allocation. As a simple example, any "record" function would always be allocated to equipment for printing or tape storage.

These 13 functions are defined in terms of processor activity and, thus, exhibit some overlap between the training and the GTT management

Figure 4. GTT Processor Functions.

• sections • FO/FIST • FIX: • howitzer activities. For example, the Control/Monitor Display function describes what is done, but the content includes both training performance information and system status information. Each of the processor functions is related in some way to the Instructor Interface, which is discussed next.

#### 5. Instructor Interface

The instructor interface provides the means by which the instructor is integrated with the processor and with the training components of the system. This interface will provide for separate transactions between the instructor(s) and each subsystem. Because this interface relates to the processor, the functions described for the processor are linked to or overlap with the interface functions. Any of the "control/monitor" functions will have an identifiable interface with the instructor. In terms of instructor performance at the interface, there are three Tier One level functions:

- a. Monitor and control training including initialization, monitoring and training exercise, as well as performance and control of the process including feedback and interrupt for instruction.
- b. Monitor and control system (GTT) status and performance.
- c. Compile and record training and system data.

#### 6. BCS/ITS

The Battery Computer System Interface Training Simulator is a component designed by the artillery to provide simulated inputs to the BCS for training FDC and FIST personnel. It has been identified as a component of the GTT for its possible use as an interface between the processor and the FDC. The entire BCS/ITS will not be required in this application, but the Program Software Support and the Lesson Tape components may be useful in establishing this interface.

#### 7. Fire Direction Center

This part of the GTT consists of the actual FDC, including the BCS and DMD. As noted earlier in regard to the FIST, the FDC will operate normally in all respects. The data being processed will be largely synthetic, but this will not be apparent to the FDC personnel. In the GTT the function performed at the FDC will be:

- a. Receipt/review/forwarding of fire mission messages.
- b. Development of technical fire direction messages.

#### 8. Howitzer

This is the fourth of the operational components in the GTT. Like the FDC, the FIST and the FO, all of the howitzer tasks will be performed as in any operational exercise. The data in the gun order will be synthetic, but this is of no consequence to the gun section. Since the ammunition will always be a FASPR or similar reusable, limited range, practice round, the ammunition

handling task will be slightly less than fully realistic. The projectile will not be selected from among several types, but weight, size and handling characteristics will be consistent with real ammunition. There can be a mock fuze-setting drill. Also, the charge will not be selected and cut, but will always be the same practice unit. The function at the howitzer will be the same as in operations:

- a. Receive and disseminate gun orders.
- b. Set the gun in azimuth and deflection.
- c. Insure howitzer safe to fire.
- d. Load and fire.
- e. Clear the howitzer and return to priority target settings.

# 9. Howitzer Simulations (FBT and FASPR)

In the paragraph above, the role of the FASPR has already been noted—to provide realistic handling characteristics in a round that will be fired only about 200 meters downrange. Because this is fired with such a light charge, the recoil simulator is required for realistic movement of the gun tube and exercise of sound and safe crew practices. The recoil simulator suggested is one now under development at USAFAS. The FBT, as proposed for use in the GTT, performs the functions of sensing and transmitting gun azimuth and elevation settings to the processor. It provides, in other words, gun crew performance measures. Because the FBT presently provides an instructor station, it may be integrated with the instructor interface at the howitzer. Depending on the architecture that emerges for the GTT, the FBT could be used almost entirely, or only its sensing and transmitting capability could be used. For the GTT it is the FBT concept that is important: the sensing of specified measures and their transmission for processing.

#### D. Implementation

The descriptions of the many functions which will be performed in the GTT are intended as a basis for further development. These descriptions do not contain sufficient guidance for an immediate design effort. They do provide guidance for the research of implementation means. As these means are identified, they can be compared to the function statements and the system requirements to arrive at a feasible implementation of the system. The process suggested here is a typical design development trade-off study. It is directed at selecting feasible means to fulfill the functions within bounds of cost, technological availability, etc. It should not be inferred that the process will be a lengthy one. The proposed GTT requires no really new development except for the observer simulator, and even that appears to be well within the state of the art. The GTT is intended to be a very practical device achievable in a relatively short time frame. It was purposely not conceptualized for a long-term advanced development.

One further comment on the functions has to do with the performance measures related to each one. The task analysis data contained in Appendix B include a host of task and task element performance measures. While all of these could be implemented, at least in theory, to do so would be impractical. It is proposed that if the GTT development is pursued, appropriate measures

can easily be selected from Appendix B. The approach would be to examine the Soldier's Manual task data for each system requirement (aggregated task) and select measures appropriate for each requirement, as well as being suitable to the mechanisms selected. The SM tasks in each aggregated task are identified in Appendix C. By going from Appendix C to Appendix B, the measures can be quickly compiled.

These comments conclude the presentation of the GTT functional description. In the next section of the report, a basic plan for using the GTT is presented.

#### VII. UTILIZATION

The GTT system implements realistic gunnery team training for the FA battery. The unit trainer (instructor) can utilize the system to conduct training for any type of indirect fire mission. The GTT system supports the guidance provided in the ARTEP and facilitates the training of the gunnery team to meet the The GTT allows the instructor to tailor gunnery team ARTEP objectives. training to meet specific unit needs. The instructor will insert the training parameters and control the operational flow of the fire mission events. He will be able to monitor the team's performance during training and can stop/slow down the fire mission events when it is apparent that intermediate performance standards are not met. The trainer can select an entire mission or can use the GTT to conduct remedial section or individual training. When the GTT is issued to a unit, it will be equipped with the basic control software so that the instructor will only have to select the initial conditions and operational parameters regarding the Gunnery Team Sections, Fire Missions, Fire Mission Tasks, Geographical Location and Seasonal/Diurnal Conditions associated with the training exercise. The GTT receives other necessary information from the instructor by means of menu-like checklists regarding the current GTT configuration, targets, ammunition resources, exercise/mission timing, displays to be used and moment-to-moment management of the training exercise. Other GTT features include maintenance and record-keeping functions which can be administered by the instructor.

The operational parameters obtained from the Fire Mission Descriptions are selected and entered into the system along with other data during initialization, and are used thereafter by the GTT in controlling, monitoring and evaluating the training exercise. Specifically, the Fire Mission Descriptions guide the instructor in selecting:

- o Gunnery Team Configuration: The OSDs and IPOs show which Sections of the Gunnery Team are involved in the Missions/Functions/Tasks to be trained.
- o Ammunition: The OSDs and IPOs help define which kinds and quantities of shells, fuzes and charges are required for the training exercises.
- o Mission(s): The OSDs help the instructor select the missions to be trained (e.g., Adjust Fire, FFE, Precision Registration, Copperhead).
- o Mission Tasks and Criteria: The OSDs and IPOs provide the SM Task numbers, activities and effectiveness criteria for evaluating performance during training.
- o Geography: The gunnery team's geographical area of responsibility and the IPOs both help in selecting the geographical context of the training exercises.
- o Environment: The IPOs help in choosing the seasonal and diurnal (day/night) context of the training exercises.

By entering this information, the instructor informs the GTT who is being trained, with what armaments, on which missions, involving the evaluation of which task elements, and under what environmental combination of geography and local conditions.

It is the instructor's option to design the training exercises (by parameter selection) so as to accomplish any of several purposes, such as:

- o Broad assessment of all gunnery team skills.
- o Diagnostic evaluation in selected missions or tasks.
- o Corrective exercises involving a limited number of tasks or gunnery team sections.
- o Acquisition of skills in newly developed or modified missions.
- o Practice for maintaining proficiency in selected missions or tasks.
- o Research on gunnery team tactics or technologies.
- o Research on, or testing of, the GTT, itself.

Should new missions, tasks or tactics be of interest, the instructor or analyst may be required to develop new OSDs or IPOs so as to insure that all relevant factors are accounted for in the subsequent exercises.

Because the insertion of initial conditions can be extensive, when one considers effectiveness measures and criteria for every gunnery team task, it is suggested that whatever means of entry is selected, the Fire Mission Descriptions will be an essential source of information about sequences, performance measures and criteria. A final use of the Fire Mission Descriptions (in the training cycle) will be to aid the interpretation of the scores or measures produced by the GTT. The proposed record of training success will be most useful when presented to the trainee in the context of the operational mission. In other words, the descriptions will play a role in the feedback of results.

Considering the Fire Mission Descriptions very broadly as "source documents," they will provide input for the basic programming of the GTT, e.g.:

- o Task sequences for each mission type.
- Performance measurements by type.

Also, as sources, they will be used to establish a specific exercise in terms of performance criteria, for example, and in terms of performance conditions and specific Soldier's Manual tasks. As has been noted, the descriptions also serve as source references for briefing and debriefing the gunnery team.

#### VIII. DISCUSSION

This section of the report provides a summing-up of the GTT development concerning issues not in the direct line of analysis and development. There is a review and comment on the whole program, followed by a note on the development of an index to denote task training requirements. After that note, there is a brief statement of the potential for applying the GTT to research in addition to its training role.

#### A. Program Review

In the course of this last program task, the entire program was reviewed, and the final revision and update of all of the earlier analyses were made. In this process it seemed appropriate to comment on the conduct of the program and to note the relative success of the approach. At the outset, this program was defined as one that would lead to an extensive, if not complete, use of synthetic training. Very early in the program this viewpoint was abandoned as being infeasible and not fully appropriate to the Field Artillery (at least in unit training). As the program progressed, it became increasingly apparent that the highly procedural nature of most of the gunnery team's tasks virtually required the use of actual equipment or physical simulations in order to achieve This was more apparent at each stage of analysis until, effective training. during the third program task, the concept for the GTT finally emerged. Until that time the accumulation and analysis of information about Soldier's Manual tasks and ARTEP tasks had yielded uniform and not very innovative or startling conclusions. With the exception of the observer tasks in target detection and location, the artillerymen's tasks were:

- o Procedural and equipment-oriented.
- o Suited to training through exercise of actual equipment.
- o Lacking, almost completely, useful and quantitative definitions of performance that could be used in training diagnosis and evaluation.
- o Perceived (by artillerymen) as quite nearly equal in criticality to system performance and more or less equally worthy of training effort.

These are valuable insights for training development, but information about training device applicability and utility was needed. It was to that end that program task three was directed. The results were not very encouraging. The artillery devices generally emulated actual operational equipment and were lacking in performance definition and measurement. Also, it was noted that these devices were not as fully used in the field as would seem desirable. Among possibly many reasons for this, it was concluded, is that the devices emphasized skill practice and not team performance. There were several things that worked to bring the need for highly realistic operational team training into a focus for this program. The device deficiencies noted above were one of these, as was the newly published ARTEP 6-100 which for the first time printed detailed sequences of task description. The result was the solidification of the need for realism in the GTT approach.

The concept that was eventually defined for the GTT depicts a system for training that is performance-based, and provides a high degree of fidelity through simulation, the use of actual equipment and the use of real fire mission procedures. The concept allows this realism in training with relatively modest expenditure of training resources because targets and environment are to be simulated for the observer, and the process of loading and firing is to be simulated with reusable, limited-range practice rounds. Also, the concept invokes good training practices through the use of instructors whose only job is training and the use of performance feedback and records. Finally, the concept reflects the need for control and management of the GTT, including evaluation of its effectiveness based on training accomplishments. While a true cost determination was beyond the scope of this program, it is judged that the implementation of the GTT concept will entail very moderate costs. components of the GTT are: operational equipment, devices already available, a device that is conceptually defined and based on a proven technology and, finally, a processor and instructor/recording units that can be off-the-shelf This is not to say that further development is unnecessary. observer simulator must be brought through the processes of engineering development and of production. Also, a substantial amount of software nd programming will be needed. However, the development cost will not approach the cost of totally new device development--especially not the cost of fully synthetic training. The GTT represents a very attainable system because it is composed of existing or nearly-so equipment. It is a major virtue of the GTT and, indeed, of its development that it is practical. The analytical tools used to develop it can easily be applied and understood, since they are essentially the traditional tools of training task analysis. The GTT, itself, being made up of operational equipment and only moderately sophisticated support components, can likewise be easily understood and used. Put another way, the GTT will provide performance-based training that can be implemented in the present Army training plan, using presently available personnel. It can be brought on line in a reasonably short period of time. The GTT does not mark a significant achievement in advanced training technology, but it does provide immediate and effective use of training resources. As already noted, its hallmark is practicality, and it provides for conservation of resources. Because it is designed to practice sound training procedures, it is also a noticeable step away from some presently poorly conceived training devices toward eventually more sophisticated, advanced training technologies.

#### B. Training Requirement Index (TRI)

One specific part of this program that merits special review at this time is the attempt to produce a single, encompassing index of training need for each task or combination of tasks performed by the gunnery team.

In the early stages of this program, a Training Requirements Index (TRI) was developed, which was intended to provide the analyst with a way of differentiating among tasks on the basis of their criticality and difficulty in system operation.\* Theoretically, the TRI can have 26 values from a low of 8

<sup>\*</sup>TRI = (System Performance Effects + Delay Tolerance)<sup>2</sup> + (Task Difficulty + Practice Required)<sup>2</sup> where the possible ratings are a) System Performance Effects: 1,2,3; b) Delay Tolerance: 1,2; c) Task Difficulty: 1,2,3,4; and d) Practice Required: 1,2,3,4,5.

to a high of 106. In actual practice, when calculated from the SME ratings of gunnery team tasks, only 10 TRI values were found across 56 SM tasks. They ranged from 25 to 89, and tended to cluster markedly at a specific value for each Section, the modes being 74 for the FO/FIST Section, 74 for the FDC Section, and 61 for the Howitzer Section. Between 60% and 80% of all TRI ratings fell at the mode for each section. There were 22 TRI ratings of 74 at the FO/FIST and 11 TRI ratings of 74 at the FDC. In view of this outcome, the primary differentiation was found to exist not between individual SM tasks so much as between Howitzer Section tasks as a whole (mean TRI = 58), FO/FIST Section tasks as a whole (mean TRI = 66), and FDC Section tasks as a whole (mean TRI = 74). Some of that Section differentiation altered when the larger number of tasks were aggregated into a smaller number for each Section, although the Section rankings remained the same with the Howitzer Section being lowest.

Approximately 18 of the 56 original SM tasks were clearly identified through the TRI as being more or less significant than the average, with 13 of them being in the FO/FIST Section where the largest number of SM tasks is found. However, it is felt that the pronounced clustering of TRI ratings may still hide some of the real differences in criticality or difficulty. Since there remains considerable confidence in the TRI as a useful index, the reasons for poor differentiation were sought primarily in the manner by which SME ratings were generated. One speculation considers the possibility that the SMEs, who are truly experts in the use of the older equipment, may have been somewhat less familiar with tasks employing such newly emerging devices as the BCS, GDU, DMD and FIST/DMD. There also remains the possibility that the TRI (which was adapted from an earlier ARI methodological study) can be made a little more sensitive, both in the individual ratings (System Performance Effects, Delay Tolerance, Task Difficulty and Practice Required) and in the manner by which they are combined into the single index.

Efforts at improving task differentiation through the TRI would be justified if a clear need can be demonstrated for allocating scarce resources o the training of selected tasks. The GTT concept, however, provides an integrated system that can be used in training all tasks, and training sequences based on the OSDs would tend to give apparent equal emphasis to all tasks. Consequently, the need for an index for the allocation of training resources appears to be less urgent now than when this program began. Attempts to improve the TRI differentiation capability thus are not recommended in the context of the GTT. The concept remains valid and even though its realization seems elusive, it should not be abandoned.

#### C. GTT Research Application

Three basic features of the GTT make it highly useful for purposes beyond the direct training of the gunnery team:

- o It focuses on the entire team (FO/FIST, FDC, Howitzer Sections)
- o It generates the most meaningful measures of individual and team effectiveness.
- It creates a record of etlectiveness under various operating conditions.

One of the most important additional purposes that such features serve is to conduct research into the many aspects of FA operations. Effectiveness can be measured under a variety of optional operating conditions and training procedures. Data bases can be generated economically and with a sufficient number of measures under controlled conditions, so as to yield statistical reliability beyond that otherwise possible. Data reduction and analysis can be conducted rapidly and efficiently with the aid of computers, because many of the parameters and measures will exist within the GTT's instrumentation. The necessary digital or analog data can be tapped off without human intervention for computer-aided immediate analysis. Retrospective analysis can be carried out from the GTT's hard copy records of those same data. The following paragraphs enlarge upon some specific ways in which the GTT is useful as a research tool.

o It can accommodate new devices, simulations, methods and manning.

The GTT's sensors, displays and controls interface with the operational equipment in ways that can accommodate most variations in that equipment. The GTT measures and evaluates basic or universal parameters (e.g., howitzer settings, time-to-fire intervals), even though crews may employ new or modified procedures in carrying out their tasks. The GTT is thus largely independent of variations in operational equipment and manning or methods of operation.

o It can create the experimental and control conditions of interest.

Operational scenarios for research purposes can be programmed into the GTT software or curricula. Specific equipment configurations, target loads, geographical conditions, and other parameters can be varied to accommodate the researcher's objectives.

o It can exercise the team in real time, adaptive, experimental scenarios.

Because GTT is so highly automated, instrumented and controllable, it can provide the dynamic, natural sequencing and responses associated with real-time operation. Sensing, measurement and data processing thus occur in real time, along with record-keeping. Diagnostic analysis can take place immediately by virtue of the on-line, computer-aided data analysis features. Consequently, there can also be a rapid adaptation of experimental exercises to concentrate analyses in critical or weak areas.

o It can produce abundant useful data rapidly, safely, reliably and economically.

The automated nature of the GTT facilitates the generation and recording of operator performance data, in programmable formats, with immediate data reduction and analysis when necessary. The GTT's interconnecting data link, solid state design, microprocessing components and related software result in much higher intrinsic reliability than would be obtained with the older electromechanical, hard-wired devices. The incremental space and financial costs

associated with this research capability are kept low for the same reasons. The research-related apparatus can be transported readily, along with the operational equipment. Overall safety is increased because of the reduced need for (and hazards of) live ammunition, large ranges and excessive fuel. Those reductions come as a result of the GTT's ability to simulate so many of the operational conditions and responses on the parts of the battery, the environment and the enemy.

The application of GTT to FA research can help achieve the long-sought improvements in target detection and identification, target locating, fire planning and fire execution for all the many missions required of the howitzer battery. The flexibility of the GTT allows for change and growth of that research capability as new weapon systems are developed and tactics are modified.

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#### **GLOSSARY**

ACE - Artillery Control Environment ADFT - Artillery Direct Fire Trainer ADP - Automatic Data Processing AG - Assistant Gunner Ammo - Ammunition Aug Opl Eqt - Augmented Operational Equipment ARI - U.S. Army Research Institute for the Behavioral and Social Sciences ARRADCOM - Army Armament Research and Development Command ARTBASS - Army Training Battle Simulation System ARTEP - Army Training and Evaluation Program ATSC - See USATSC BCS - Battery Computer System BCS/ITS - Battery Computer System Interface Training Simulator BRL - Ballistic Research Laboratory C [C1,C2,C3,C4] - Cannoneer [number indicates cannoneer position number] CAMMS - Computer Assisted Map Maneuver Simulation CATTS - Combined Arms Tactical Training Simulator C/C - Control/Coordinate Ch Sec - Chief of Section CLTC - Closed Loop Training Concept COHORT - Cohesive Operational Readiness Testing COLTSIM - Company/Team Level Training Simulation System Demo Mtls - Demonstration Materials DF - Deflection DF - Direct Fire DIVARTY - Division Artillery DMD - Digital Message Device EOM - End of Mission ETHER - Realtime Software Simulation of Communications Nets ETM - Extension Training Material (F) - Fire FA - Field Artillery FADAC - Field Artillery Digital Automatic Computer FASCAM - Family of Scatterable Mines FAFSTS - FA Fire Support Training System FASPR - Field Artillery Shootable Practice Round FBBC - First Battle: Battalion-Corps FBT - Firing Battery Trainer FDC - Fire Direction Center FDO - Fire Direction Officer FD Specialist - Fire Direction Specialist FFE - Fire for Effect FIST - Fire Support Team FIST Ch - Fire Support Team Chief FIST DMD - Fire Support Team Digital Message Device FIST V - Fire Support Team Vehicle FM - Fire Mission FO - Forward Observer FOT - Forward Observer Trainer

(FP) - Fire Plan

FSO - Fire Support Officer

FS Sgt - Fire Support Sergeant

G - Gunner

GDU - Gun Display Unit

GLLD - Ground Laser Locator Designator

G/VLLD - Ground/Vehicular Laser Locator Designator

G/VLLD-T - Ground/Vehicular Laser Locator Designator-Trainer

G/VLLD-TV - G/VLLD with television camera

HC Smoke - White Smoke Projectile

HD - Howitzer Driver

HE - High Explosive

HEL - Human Engineering Laboratory

IF - Indirect Fire

IFES - Indirect Fire Engagement Simulation

Instr - Instructor

IOC - Initial Operating Capability

IPO - Input-Process-Output

ISD - Instructional Systems Development

JWG - Joint Working Group

(L) - Load

LITR - Low Cost Indirect Fire Training Round

LRF - Laser Range Finder

MACOM - Major Army Command

MILES - Multiple Integrated Laser Engagement System

MLRS - Multiple Launch Rocket System

MMT - Miniature Moving Target

MOS - Military Occupational Specialty

MOUT - Military Operations in Urbanized Terrain

N/A - Not Applicable

Opl Eqt - Operational Equipment

Pantel - Panoramic Telescope

PD - Point Detonating (Fuze Action)

PM-TRADE - Program Manager-Training Devices

QE - Quadrant Elevation

RFAF - Request for Additional Fire

SAWE - Simulation of Area Weapons Effects

SCA - Section Chiefs Assembly

SIMFIRE - Simulated Fire

Sims - Simulator(s)

SM - Soldier's Manual

SMEs - Subject Matter Experts

STABS - Stand Alone Tactical Artillery Battle Simulation

STAGS - Simulated Tank Antiarmor Gunnery System

TACF - TACFIRE

TACFIRE - Tactical Fire Direction System

TASC - Training and Audiovisual Support Center

TBD - To Be Determined

TDs - Training Device(s)

TDLRs - Training Device Letter Requirement(s)

TDNSs - Training Device Need Statement(s)

TRI - Training Requirement Index

TOE - Table of Organization and Equipment

TOW - Tracking Optical Wire Guided Missile
TSFO - Training Set Fire Observation
TV - Television
USAFAS - U.S. Army Field Artillery School
USATSC - U.S. Army Training Support Center
VAC - Volts Alternating Current
VDC - Volts Direct Current
VFMED - Variable Format Message Entry Device

# APPENDIX A REPRESENTATIVE FIRE MISSIONS

# Table of Contents

			Page
Α.	Intr	roduction	A-2
В.	GTT	Relationship to the ARTEP	A-2
C.	Des	cription of OSD Representative Fire Missions	A-1:
	1.	Low Angle, Adjust Fire, When Ready, Non-autonomous	A-1:
	2.	Low Angle, Adjust Fire, At My Command, Autonomous	A-20
	3.	Fire-for-Effect, Target of Opportunity, When Ready, Autonomous	A-3(
	4.	Precision Registration, Quick and Time	A-34
	5.	Copperhead, Target of Opportunity, Autonomous	A-45

#### APPENDIX A

#### REPRESENTATIVE FIRE MISSIONS

#### A. Introduction

This appendix contains a description of the derivation of a representative set of fire missions. Each mission is described in a brief narrative as well as in an Operational Sequence Diagram (OSD). This information can be programmed into the GTT to provide for unit training of the total gunnery team as well as for section training. The essential purpose of structuring training in terms of actual fire missions is to achieve a high level of realism. By using the fire missions appropriate to a unit's responsibility, the team is trained to perform as it will in combat and perfect their skills using real procedures, messages and equipment.

The use of these descriptions as conceptualized for the GTT has been described in Section VII of this report. These materials can also be used in any other training. They are complete and accurate descriptions of the indirect fire process in howitzer systems typified by the baseline. Thus, they can provide structure for a live or a dry firing exercise or could even be used in a classroom setting for indoctrinating gunnery teams. These descriptions can also serve as guidance--perhaps even as a checklist--for both instructors and trainees.

In the discussion preceding the actual descriptive material, the relationship between the descriptions and the ARTEP manual for the baseline is presented. This is done to demonstrate the correspondence between the two documents which provides a "validity check." More importantly, since the ARTEP is the official means by which total unit training is implemented, this "crosswalk" demonstrates the completeness of the GTT approach.

Just a brief summary of the GTT approach will help the understanding of the descriptive material to follow.

The GTT will be comprised of instrumented operational equipment and devices and simulations that permit each of the gunnery team subsystems (FO/FIST, FDC and Howitzer Sections) to perform in an integrated fashion to accomplish training objectives. The primary function of the GTT is as a unit training system for training, improving and exercising gunnery team skills, knowledges and attitudes that are necessary for successful performance of indirect fire missions. The GTT is unique in that it will provide the capability to exercise any representative fire mission that the gunnery team is expected to perform in combat. Gunnery team performance will be measured on-line for immediate evaluation of performance and for evaluation and diagnosis of performance during and after the conduct of training.

## B. GTT Relationship to the ARTEP

In conducting gunnery team training, the GTT system strives to accomplish the same objectives as the ARTEP. Both the ARTEP and GTT system require hands-on, performance-oriented training to train, diagnose deficiencies and evaluate combat readiness. The difference between the two is

that the ARTEP is a collective training program for an entire unit performing all mission segments; whereas the GTT system focuses on only the Engagement mission functions and tasks, i.e., the integrated conduct of fire tasks performed by the gunnery team. For the FA unit, the ARTEP prescribes the tasks, combat condition and performance standards that must be accomplished during the Emplace, Engage, March Order and Move mission segments. program recognizes that an FA unit must train in each of these mission However, as pointed out previously, the training resources associated with live firing during the Engagement mission segment are becoming The GTT strives to be the training vehicle by which less and less available. ARTEP Engagement mission tasks can be trained, diagnosed and evaluated with equal or better training effectiveness, while at the same time reducing training Through simulations and devices, the GTT will be able to resource costs. expand ARTEP tasks to include fire missions with various types of special ammunitions such as the improved conventional munitions, the family of scatterable mines and numerous Copperhead missions at moving and/or stationary targets.

The ARTEP manual of the baseline system, 6-100: The Field Artillery Cannon Battery, 17 February 1984, presents training and evaluation outlines of doctrinal mission(s) and tasks organized by battery section and platoon. The combat readiness/effectiveness of the battery, section, or platoon can be inferred by its ability to perform the ARTEP tasks. ARTEP 6-100 designates the mission of the Field Artillery Cannon Battery as "Provide Field Artillery Fires." To accomplish the battery mission, each gunnery team section has the following supporting mission:

Gunnery Team Section/Platoon	ARTEP Mission Number	Mission
FO/FIST	3-111-2	Provide Forward Observations
FIST Headquarters	3-111-1	Provide Fire Support Coordination
FDC (Battery)	3-1-6	Provide Fire Direction Support
Howitzer Section	3-1-7	Provide Howitzer Support

For each gunnery team section, the ARTEP further identifies the tasks/subtasks, supporting soldier manual tasks, (combat) conditions, and training (performance) standards which must be performed to accomplish the section/platoon mission. However, ARTEP tasks and subtasks within each (section) mission are not presented in any "tactical or technical order."

It is appropriate at this point to note a problem with the use of certain key words: mission, function and task. In traditional training analysis, these words have a practically universal connotation. However, in the source documents used in this program, they have different connotations determined by context.

The word "mission" is used to denote the overall purpose or objectives of a unit, such as "Provide Field Artillery Fires" (which is the mission of the baseline system). The word is also used in the phrase "fire mission" to denote specific activities to carry out a particular kind of artillery firing, such as high explosive or illumination. A final usage of "mission" is in the ARTEP which uses the word to denote a group of functionally related tasks, such as "Provide Howitzer Fires." In that usage, all fire missions and methods of fire are subsumed under "Provide Howitzer Fires."

The word "task" has two distinct uses: in the Soldier's Manual, it is used to denote an activity performed by one person individually or working together with other crew members. This usage is quite close to that which is common to many tasks analysis methods. However, in the Soldier's Manual, there are wide differences in the complexity of tasks. Some involve many discrete activities, any one of which could be defined as a "task." Others appear to be a single, definable activity with input and output which traditionally characterize a "task." In the ARTEP, the phrase "ARTEP task" is used to denote a set of functionally related activities made up of several Soldier's Manual tasks. This mixed usage makes it difficult to convey previse meanings. The following comparison of traditional usage with ARTEP usage will help clarify meanings:

Traditional Term	ARTEP	Example
Mission	Mission	"Provide Direct Support"
Mission Segment	(none)	"Occupy, Engage, March Order, Move"
Functions	ARTEP Tasks	"Conduct Indirect Fire Mission," etc.
Tasks	Soldier's Manual	"Request and Adjust Area Fire," etc.

Prior to organizing the representative fire missions, an analysis was performed to determine the relevant ARTEP tasks which may be performed during the Target Engagement process by the gunnery team. The results of this analysis are shown in Figure A-1.

# 1. Target Engagement Process and a Description of Fire Missions

The Target Engagement process is initiated by the FO/FIST once a target has been acquired. The target is located and a call for fire is prepared and transmitted to FDC. The remaining processes interactively involve both the FDC to provide the required fire direction support and the howitzer section(s) to produce the cannon fires. The observer requests any required subsequent adjustment prior to fire-for-effect. The process is terminated when the desired effect on the target has been achieved. For FO/FIST, ARTEP Task 3-III-2-3,

Section		ARTEP Tasks	Section		ARTEP Tasks	Section		ARTEP Tasks
FO/FIST	3-III-2-2	Locate Targets	FDC (TACEIRE)	3-1-6-6b	Determine and Update	Howitzer	3-1-7-2	Execute Fire Commands
	3-III-2-3	Conduct Indirect Fire Missions	BCS)	3-1-6	negistration Data		3-І-7-2в	Process Fire Commands
	3-III-2-3a	Conduct Adjust Fire Missions		3-1-6-7	Attack Targets		3-1-7-2b	Prepare Ammunition for Firing
	3-III-2-3b	Conduct Fire for Effect		3-I-6-7a	Determine Method of Attack		3-I-7-2c	Load Howitzer
	3-111-2-3c	Missions Conduct a Precision		3-I-6-7b	Issue Battery Fire Order		3-I-7-2d	Lay Howitzer for Direction and Quadrant
	<b>}</b>	Registration		3-I-6-7c	Process Battalion Fire Order		3-I-7-2e	Fire the Howitzer
	3-III-2-3d	Observe Munition Effects and Report Battle Damage Assessments		3-1-6-8	Determine Firing Data		3-I-7-1g	Lay on Planned Priority Target
FIST Headquarters	3-111-1-3	Coordinate/Control Fire Support Assets on		3-1-6-9	Control/Coordinate Fire Missions			
	3-III-1-3h	Surface Targets		3-І-6-9а	Contro./Coordinate Registrations			
		for Immediate Fire Support		3-I-6-9b	Control/Coordinate Adjust Fire Missions			
	3-III-1-3c	Perform Target Analysis		3-I-6-9c	Control/Coordinate			
	3-111-1-6	Locate Targets of Opportunity and Transmit Calls for Fire for Copperhead			FIRE-10F-EIIEGI MISSIONS			

Figure A-1. ARTEP 6-100 Tasks Which May be Performed During the Engagement Mission Segment by the Gunnery Team

Designate Target of Opportunity for Copperhead

3-III-1-6a

Conduct Indirect Fire Missions, identifies three categories of fire missions directly involving the gunnery team, i.e., adjust fire missions, fire-for-effect missions and registration missions. A fourth category is identified by ARTEP Task 3-III-1-6, Locate Targets of Opportunity and Transmit Calls for Fire for Copperhead. Within each of the categories, the ARTEP identifies the following types of fire missions.

#### a. Adjust Fire Mission

This type of fire mission is conducted whenever the target location cannot be accurately determined by the observer. Consequently, an adjustment of artillery fire may be required to adjust the impacting rounds relative to the target in range, lateral deviation and/or height of burst. The ARTEP identifies the following adjust fire missions:

- o Low and high angle adjust mission
- o Final protective fire adjust mission
- o Assault fire mission
- o Destruction mission
- Simultaneous mission
- o Quick smoke mission
- o Illumination mission
- o High explosive under illumination adjust mission
- o Large or irregularly shaped target adjust mission

The observed fire Soldier's Manual tasks performed by the observer in initiating adjust fire missions and requesting subsequent adjustments are identified in SM 6-13F, Fire Support Specialist, as follows:

SM Task No.	Task Name
061-283-1011	Request and Adjust Area Fire
061-283-1021	Request and Adjust Continuous Illumination
061-283-2001	Request and Adjust Area Fire Using Creeping
	Procedures
061-283-2002	Request and Adjust Final Protective Fires
061-283-2003	Request and Adjust Fire on Irregularly Shaped Targets
061-283-2004	Request and Adjust Area Fire Using Sound Adjustment
	Procedures
061-283-2022	Build and Maintain a Quick Smoke Mission
061-283-2103	Conduct a Destruction Mission

#### b. Fire-for-Effect Mission (FFE)

Observer initiated FFE missions are conducted when little or no artillery fire adjustments and/or immediate artillery effect on a target at a known location are required. They may be fired on planned target locations or targets of opportunity. The ARTEP identifies the following fire-for-effect missions:

- o Fire-for-effect (planned or accurately located target) mission
- o Immediate suppression mission
- o Immediate smoke mission
- o Priority target mission

The observed fire Soldier's Manual tasks performed by the observer in initiating and conducting FFE missions are identified in SM 6-13F as follows:

SM Task No.	Task Name
061-283-1013	Conduct a Suppression Mission
061-283-1014	Conduct an Immediate Suppression Mission
061-283-1015	Conduct a Fire-for-Effect Mission
061-283-2021	Conduct an Immediate Smoke Mission

#### c. Registration Mission

Registration missions are conducted to determine firing data corrections for non-standard conditions, errors in battery location, errors in the lay of the howitzers, errors in the firing chart and performance differences in ammunition lots. Although there are several types of registration techniques which may be employed, e.g., high burst/mean point of impact (HB/MPI), precision, abbreviated HB/MPI, etc., the ARTEP identifies "Conduct a Precision Registration, Quick and Time" as the type of registration task performed by an observer. The SM task which supports this mission is 061-283-2102 entitled, "Conduct an Impact and Time Registration."

# d. Copperhead Mission

This type of mission is typically conducted against armored targets (moving and/or stationary) when the observer is equipped with a ground/vehicular locator laser designator (GLLD) and Copperhead ammunition is fired. The following supporting observer SM tasks may be performed in initiating and conducting this type mission:

SM Task No.	Task Name
061-274-3973	Lase a Stationary Object
061-274-3974	Lase a Moving Target
061-274-3976	Lase a Stationary Target (limited visibility)
061-27403977	Lase a Moving Target (limited visibility)
061-274-3979	Adjust Indirect Fire with GLLD
061-274-3989	Designates a Target for Laser Guided Munitions

#### 2. Gunnery Team Baseline System

For purposes of this program, the baseline system analyzed was the gunnery team system within a "Division 86" 155mm Self-Propelled Field Artillery Battalion. Further, the OSDs were to describe the sequential functions and

tasks performed by the gunnery team during target acquisition and target engagement utilizing advanced artillery equipment and digital communications. These equipments include the Fire Support Team Digital Message Device (FIST DMD), Digital Message Device (DMD), the Battery Computer System (BCS), the Ground Laser Locator Designator (GLLD), TACFIRE, etc. The development of the OSDs considered both non-autonomous and autonomous operations, i.e., under battalion TACFIRE control (non-autonomous) and without TACFIRE control (autonomous). Tasks performed within battalion FDC (TACFIRE) were not analyzed. Only those gunnery team fire mission communication tasks that interact with the TACFIRE system are contained in this analysis.

#### a. Sources of Information

ARTEP 6-100 provided the structure for the team's functional relationship and to some degree the sequencing of SM tasks within the fire missions. The SM's identify reference material, i.e., Field Manuals (FM's), Technical Manuals (TM's), and other reference materials which were an aid in developing the flow of functions and tasks. Generally, FM's describe tactics, doctrine and employment techniques, while TM's provide operator equipment procedures. At the time of the OSD development, operator tasks and procedures were not fully documented for the following equipment: BCS, FIST DMD, GLLD, GDU, and DMD. For this advanced equipment, operator tasks and sequences were derived from draft contractor publications, equipment functional descriptions and/or equipment operational and organizational plans. Descriptions of operator tasks and fire mission flows were also obtained from USAFAS artillery subject-matter experts (SME). The experience of the program staff with operational and developing systems was also applied.

# b. Representative Fire Missions

For each of the four fire mission categories, a fire mission was selected as being representative of all the fire missions in a particular category. The depicted missions include the tasks performed by the gunnery team in the engagement process. The following fire missions were selected:

#### Adjust Fire Mission

Low Angle, Adjust Fire, When Ready (WR), Non-autonomous Low Angle, Adjust Fire, At My Command (AMC), Autonomous

# Fire-for-Effect Fire Mission

Fire-for-Effect, Target of Opportunity, When Ready, Autonomous

#### Registration Fire Mission

Precision Registration, Quick and Time

# Copperhead Fire Mission

Copperhead, Target of Opportunity, Autonomous

#### 3. Developing the Operational Sequence Diagrams (OSDs)

The ARTEP tasks and supporting SM tasks were systematically organized to develop representative fire missions that depict the sequential flow of gunnery team functions and tasks during the conduct of a fire mission. Operational Sequence Diagrams (OSDs) were developed for each representative fire mission.

Before presenting the OSD fire mission descriptions, it is perhaps helpful to understand the OSD technique. The OSD is a symbolic and verbal representation of functionally related tasks for a particular system under specifically designated operating conditions. It contains a sequential arrangement of annotated symbols and operational flow lines within and between the individual operating subsystems (elements or work stations) that comprise the system of interest. The operational sequence defines the consecutive activities that are carried out in completing a particular mission under a given set of environmental, tactical and organizationally imposed conditions. Because it organizes the set of tasks in a systematic way by individual operating subsystems, the OSD can serve as a tool for analyzing workloads for each subsystem, determining requirements for controls/displays/communications and assessing time requirements. In addition, it can serve as a model for mission simulations, and facilitate diagnostic studies of system or mission efficiency. Finally, it can provide a structure for the development of training programs, by identifying what must be accomplished, by which personnel or equipment, in what sequence and in what time period.

The OSDs developed for this program show the sequence of functions and tasks beginning with "Locate Targets" and ending with "End of Mission." Where appropriate, each function is keyed to its ARTEP Task Number, e.g., observer ARTEP task 3-III-2-2, Locate Targets, and SM tasks are numbered and titled. Each function and task is listed, in order, at the left of the diagram. Across the top of the diagram are named the positions within the gunnery team arranged by section. On the diagram, a solid line depicts the flow among the positions for the information or other output of each function. Broken lines indicate an alternative flow of information. Each function is connected by a divided line to the point on the diagram at which it occurs. The symbols and their meanings are shown in Figure A-2.

ACTIVITY Other Notations 000-000-000		Function/Task, appears with others	n a fixed sequence			'unction/Tusk, appears alone. May take	blace concurrently, but not in any fixed	elative sequence, with other tasks.					Operate (Alternate Assignment)
Other Notations		hers				May take	any fixed	usks.					
	781)		FIST Section	FO F: T	Fs Set		BTRY FDC	FDO Ch FD SP SR FD SP FD SP	HOWITZER Section	Ch Sec G AF	ی		
Soldier's Mennal Teck	Soldier's Manual Task To Be Determined		Fire Support Team Section	Forward Observer	Fire Support Team Chiel Fire Support Sergeunt		Battery Fire Direction Center	Fire Direction Officer Chief Fire Direction Specialist Senior Fire Direction Specialist Fire Direction Specialist		Chief of Section Gunner Assistant Gunner	Cannoneer (Number 1-5)		

Figure A-2. OSD Symbols and Notations

# C. Description of OSD Representative Fire Missions

The following paragraphs are descriptions of each of the OSD depicted missions and are related to the ARTEP sequences.

#### 1. Low Angle, Adjust Fire Mission, When Ready, Non-autonomous

This fire mission is shown in Figure A-3 on the following page. mission flow is initiated by the FO of the FIST section by performing the function "Locate Target" (ARTEP Task 3-III-2-2), As shown on the diagram, the FO can locate the target by performing any one of four supporting SM tasks, e.g., locate by grid coordinates, polar plot, shift from a known point, Once the target is located, the observer performs function 3-III-2-3a, Conduct Adjust Fire Mission, by preparing and transmitting his call for fire. In performing function 3-III-1-3b, Monitor/Process Request for Immediate Fire Support, the FIST Headquarters, via the FIST DMD, has several options depending on how the observer appears in the FIST DMD subscriber file, i.e., in the "Review" mode, "Fire Request Approval" mode, or "Automatic" mode. Once transmitted through the FIST DMD, the fire mission is received by TACFIRE who performs the tactical fire control solution, transmits the FM;FC to the battery FDC, message to observer (MTO) and FM; RFAF to the battalion fire support officer (FSO). Upon receipt of the FM; FC message, the battery FDC performs functions 3-I-6-7c, Process Battalion Fire Order; and 3-I-6-8, Determine Firing Data, which result in the transmitting of the gun orders to the howitzer section. The howitzer section performs function 3-I-7-2a, Process Fire Commands, and all supporting functions to produce the initial howitzer fires, i.e., 3-I-7-2b, Prepare Ammo for Firing; 3-I-7-2d, Lay Howitzer for Deflection and Quadrant; 3-I-7-2c, Load Howitzer; and 3-I-7-2e, Fire Howitzer. The howitzer section's Chief-of-Section transmits SHOT on ROUNDS COMPLETE via the Gun Display Unit (GDU). The battery FDC transmits SHOT and SPLASH messages, as appropriate. Upon observing the impact of the round(s), the observer performs function 3-III-2-3a, Conduct Adjust Fire Mission, in determining and transmitting the subsequent adjustment (SUBS ADJ). Depending on the FIST DMD subscriber table, the SUBS ADJ message is processed through FIST to TACFIRE. TACFIRE transmits an FM;FC message to The battery FDC and howitzer section perform the same tasks in determining firing data and processing the gun orders during the first and second subsequent adjustments. After the howitzer section has completed the fire-for-effect (FFE) phase of the mission, the observer performs function 3-III-2-3c, Observe Munition Effects and Report Battle Damage Assessment, and transmits end of mission (EOM) to TACFIRE. The battery FDC receives the EOM and transmits EOM to the howitzer section. The howitzer section receives the EOM message, acknowledges and ends by performing function 3-I-7-1g, Lay on Priority Target.

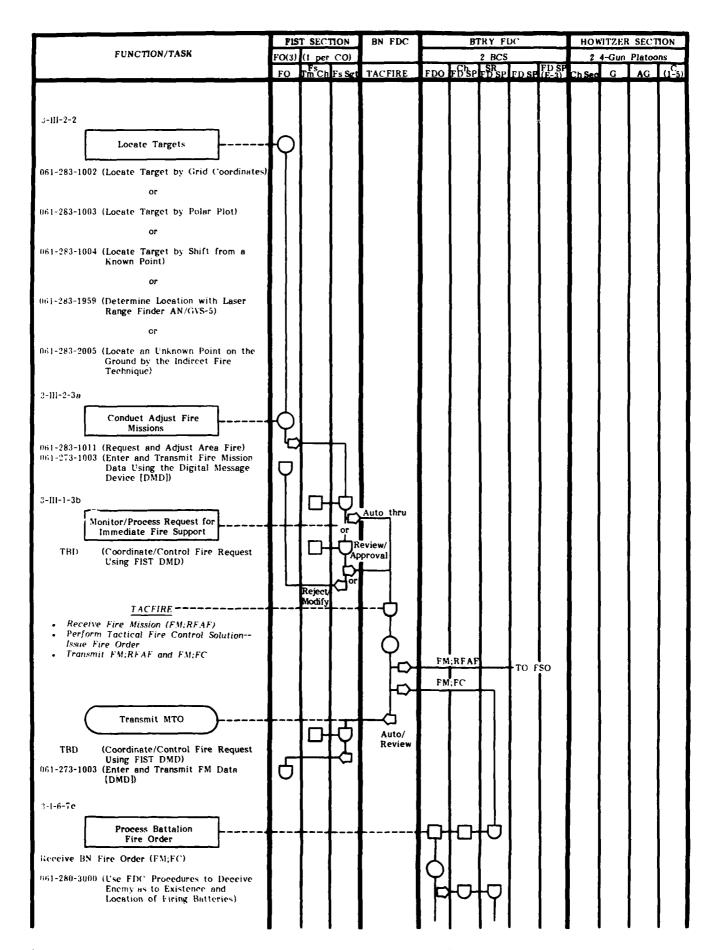
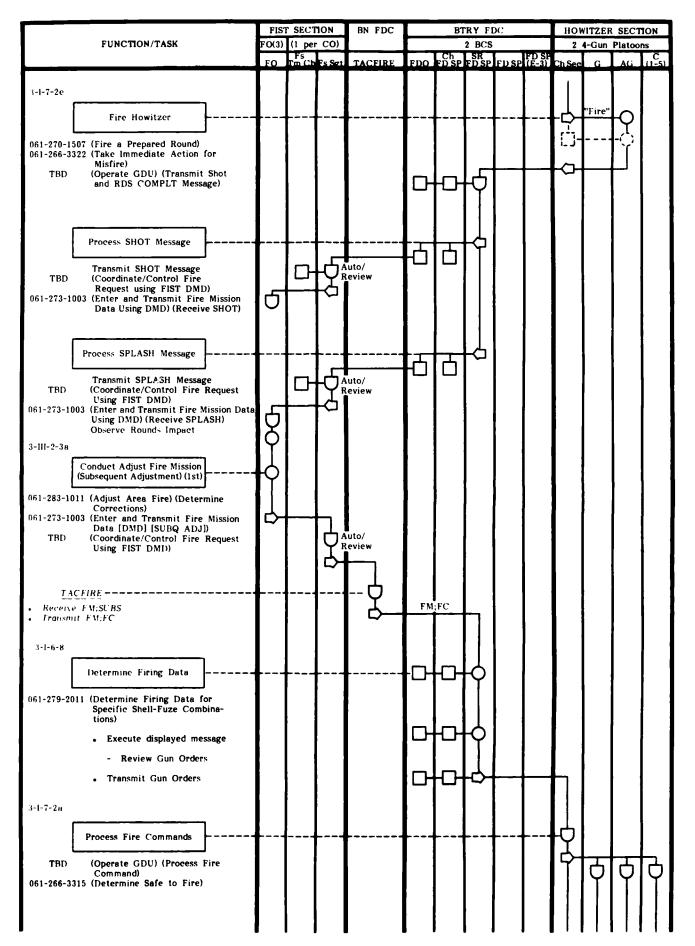
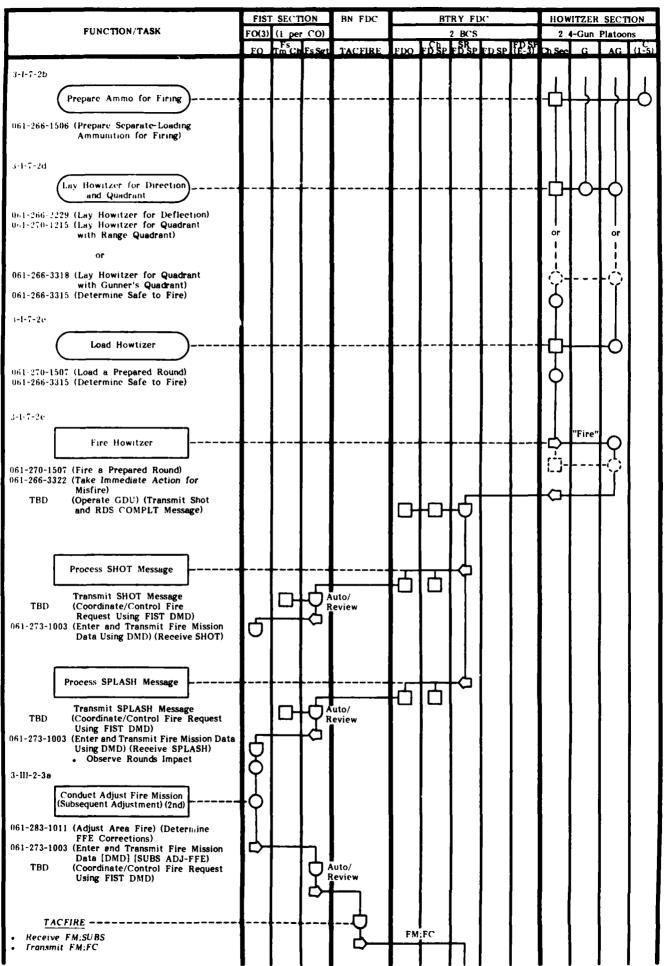
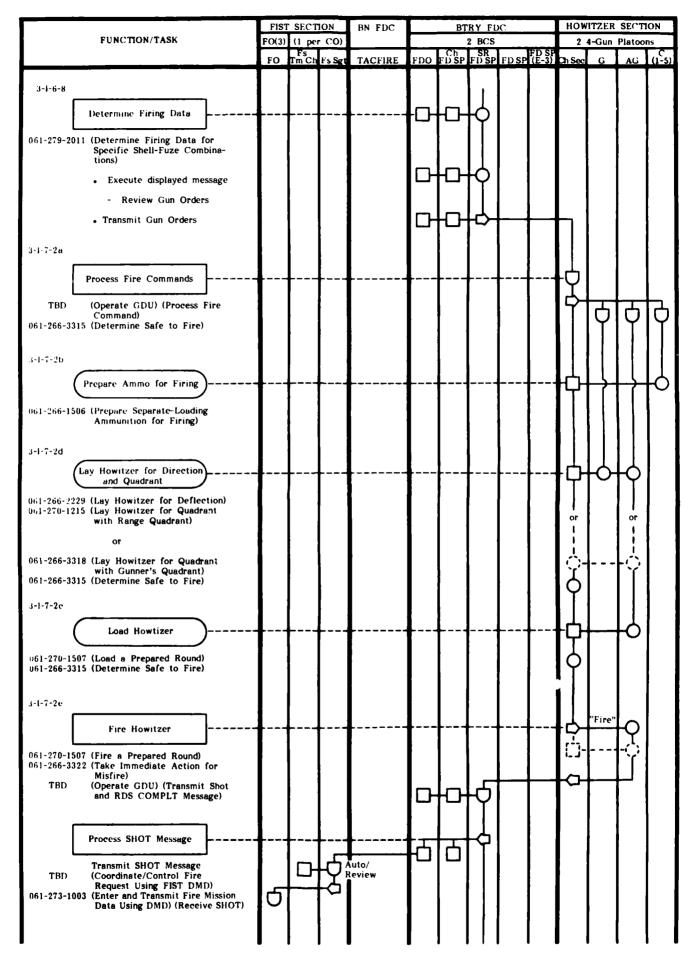


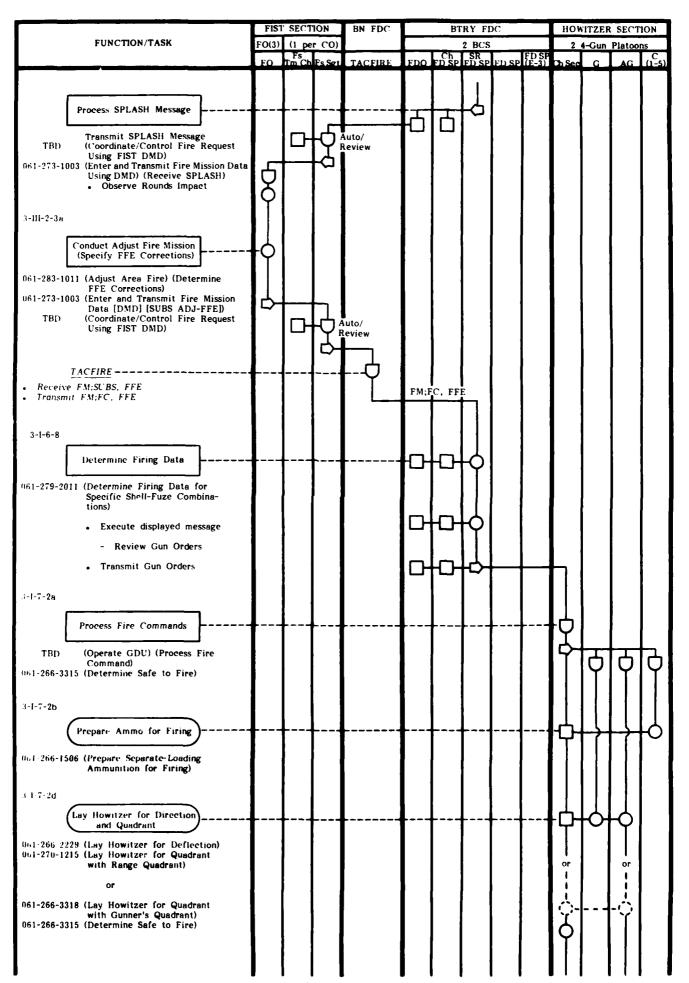
Figure A-3. Low Angle, Adjust Fire Mission, When Ready (WR), Non-Autonomous.

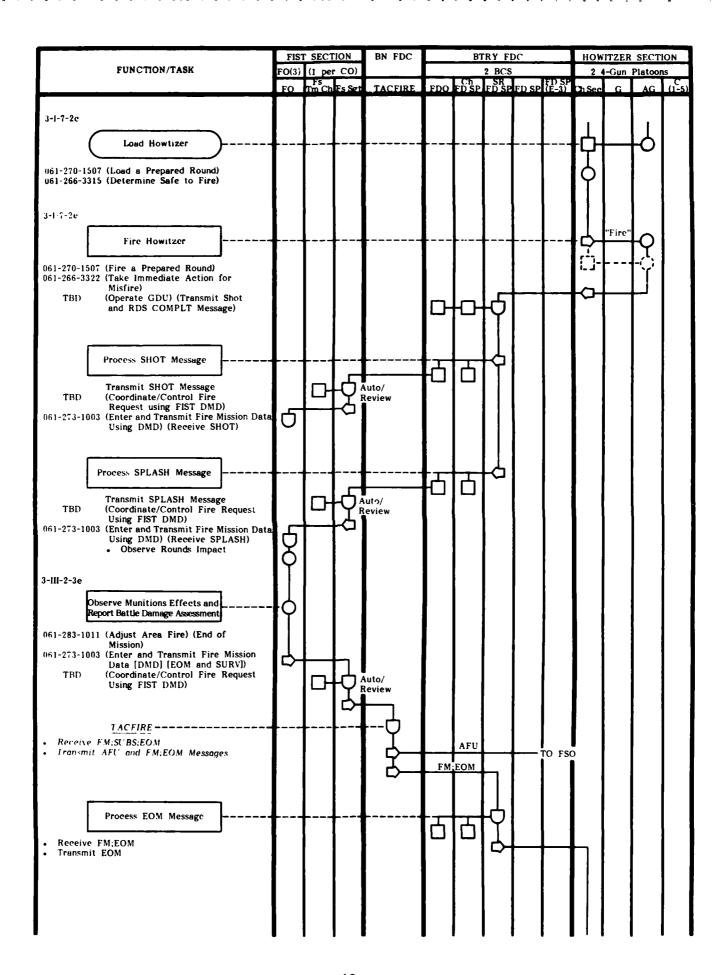
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3-I-7-2a  Process Fire Commands  TBD (Operate GDU) (Receive EOM)  • Process Fire Command										<del>0 ф ф-</del>	<del>-</del>	<del>-</del> 0-	Q.
Lay on Planned Priority Target  061-266-2229 (Lay Howitzer for Deflection) 061-270-1215 (Lay Howitzer for Quadrant with Range Quadrant)										ф	<b>-</b>	0	

## 2. Low Angle, Adjust Fire, AMC, Autonomous

This fire mission is shown in Figure A-4 on the following page. The mission is autonomous since it is not under battalion TACFIRE control. In the autonomous role, the battery FDC performs both the tactical and technical fire direction to determine the gunnery solution. In the previous example, adjust fire, non-autonomous, the battalion FDC TACFIRE provided the tactical gunnery solution, and the battery FDC via the BCS provided the technical solution, i.e., the Fire Command (gun orders) to the howitzer section. The term "at my command (AMC)" is a special instruction requested by the observer which restricts the howitzer section from firing until the "Fire" message is transmitted by the observer.

The "Locate Target" function is initiated by the observer by performing one of the supporting SM tasks. The reader will note that the sequential flow of tasks for this function, "Conduct Adjust Fire Missions" and "Monitor/Process Request for Immediate Fire Support" functions are essentially the same as the non-autonomous, adjust fire mission. In processing the fire mission, the battery FDC performs the following functions: 3-I-6-8b, Coordinate/Control Adjust Fire Missions; 3-I-6-7a, Determine Method of Attack; 3-I-6-7b, Issue Battery Fire Order; and 3-I-6-8, Determine Firing Data. BCS operator transmits the RFAF message to the FSO, the gun orders to the howitzer section and the Message to Observer (MTO) to the observer. howitzer section performs the following functions in executing the gun orders: 3-I-7-2a, Process Fire Commands; 3-I-7-2b, Prepare Ammo for Firing; 3-I-7-2d, Lay Howitzer for Direction and Quadrant; and 3-I-7-2c, Load Howitzer. howitzer section transmits that they are ready to fire to the battery FDC. battery FDC transmits the READY message to the observer. The observer then transmits the FIRE message to the howitzer section. The howitzer section fires and transmits the SHOT and ROUNDS COMPLETE message to the battery FDC. The battery FDC responds by transmitting the SHOT and, when appropriate, the SPLASH messages. Once the observer determines the subsequent adjustment data, he transmits the SUBS ADJ message to the battery FDC and the functions performed by both the Battery FDC and Howitzer Sections are repeated as previously described. After the howitzer section has completed the FFE phase of the mission, the observer performs function 3-III-2-3c, Observe Munition Effects and Report Battle Damage Assessment, and transmits EOM to the battery FDC. The battery FDC transmits a FM; SUBS message to the FSO and an EOM message to the howitzer section. The section acknowledges and ends the mission by performing function 3-I-7-1g, Lay on Priority Target.

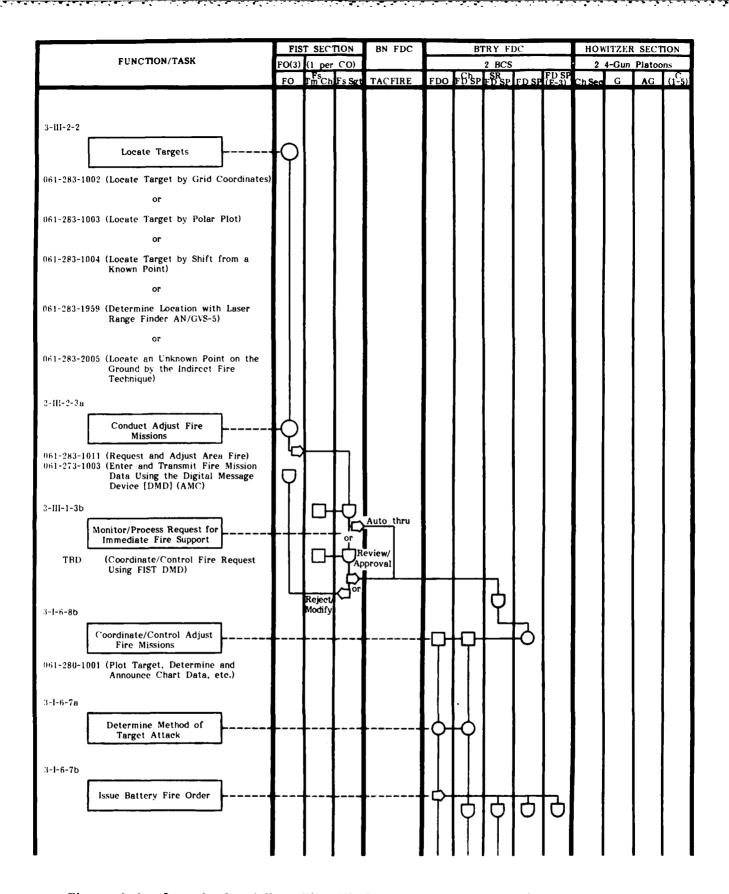
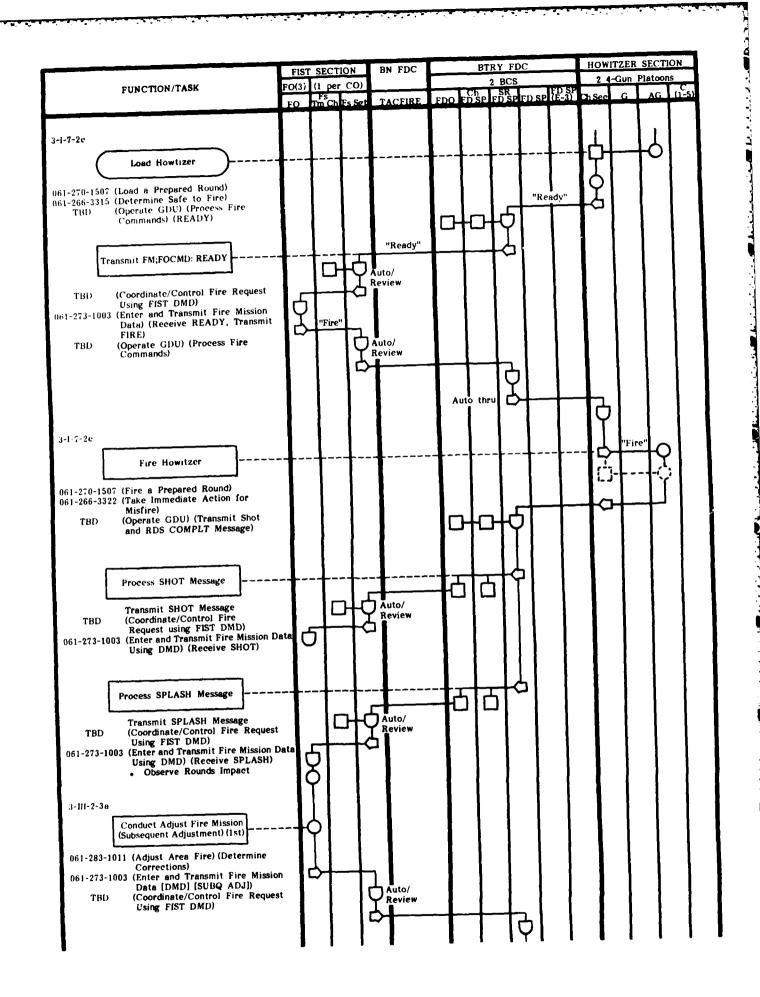
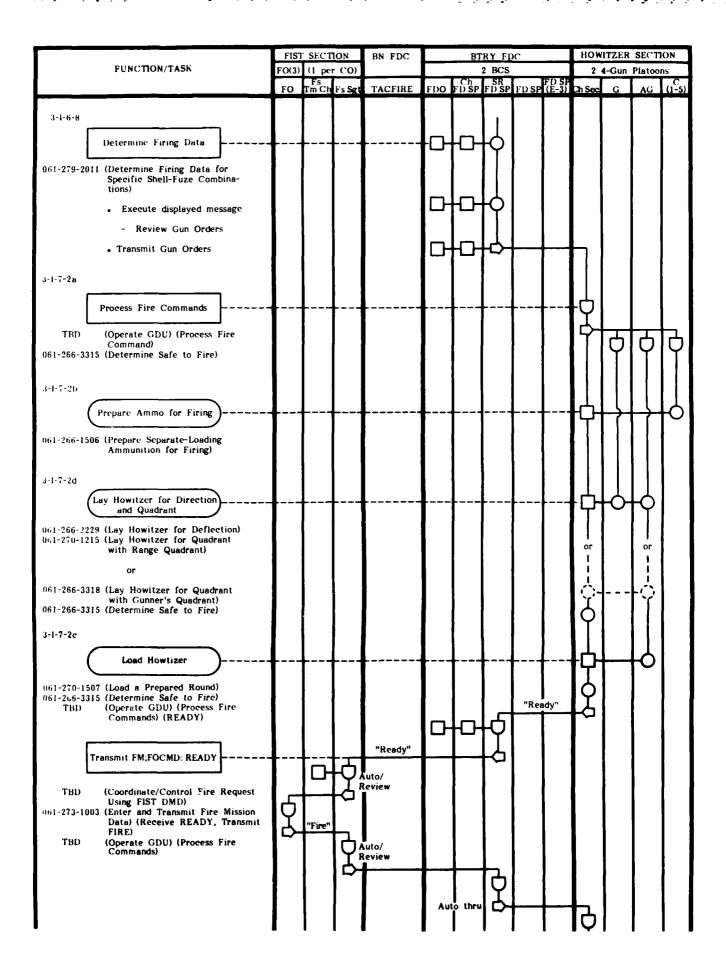
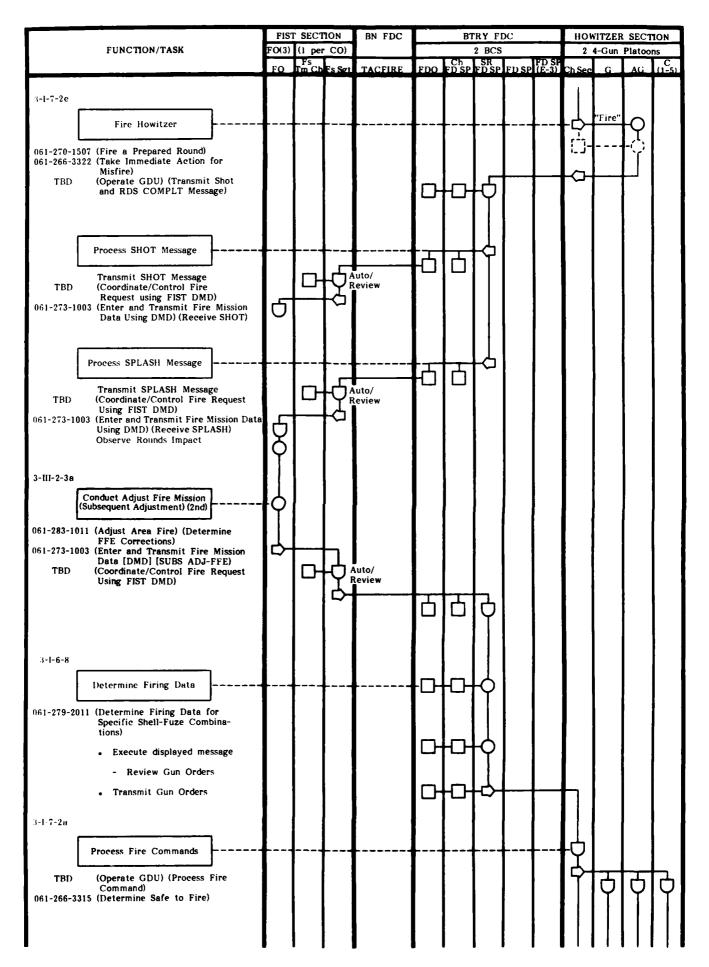


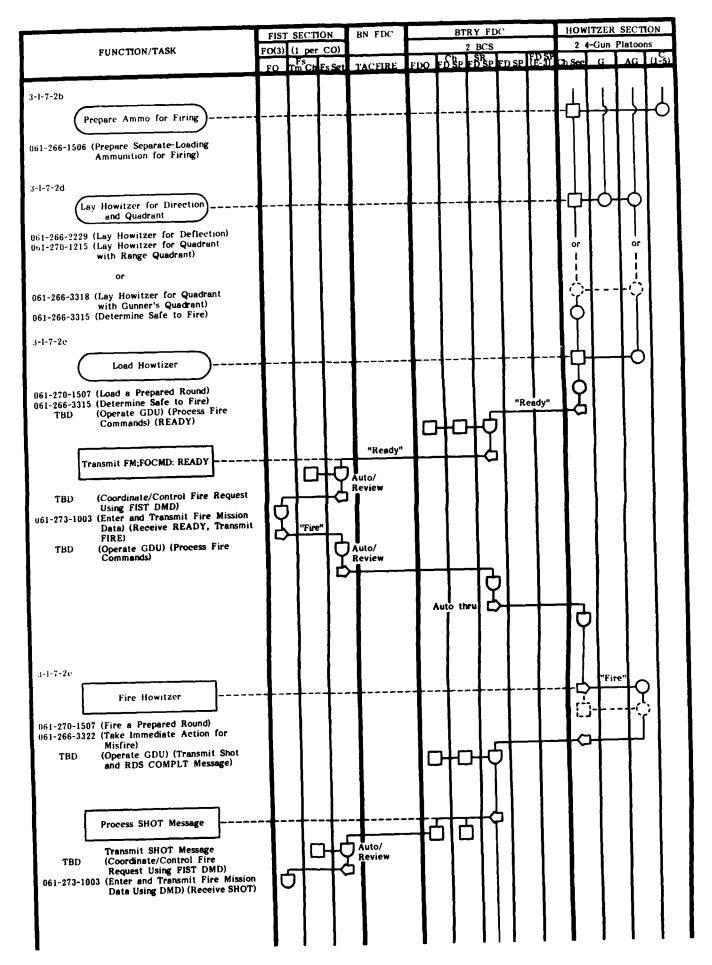
Figure A-4. Low Angle, Adjust Fire Mission, At My Command (AMC), Autonomous.

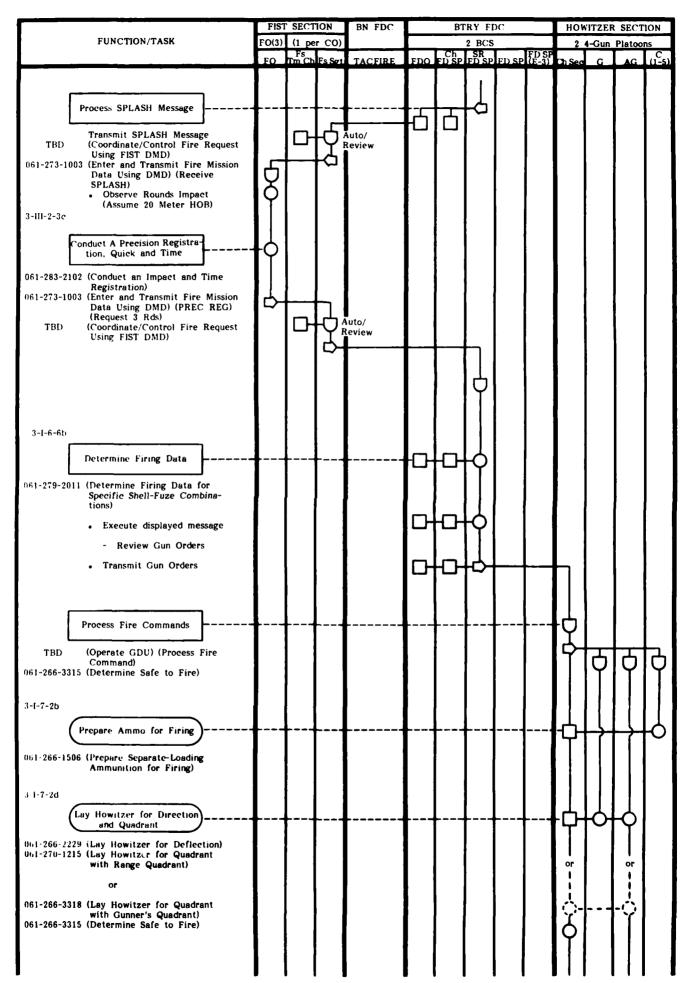
		SECTION			BTRY FI	OC	_	VITZER		
FUNCTION/TASK	FO(3)	(1 per CO	)	-	2 BCS	FD SP		4-Gun		
	FO	Tm Ch Fs S	gt TACFIRE	FDO F	OSP FUSP	FD SP RE-37	Ch Sec	G	AG	(1-5)
Oetermine Firing Data  Review displayed FM;RFAF and process in accordance with Fire Order  061-279-2002 (Determine Firing Data Using BCS [Area Mission] for a Target Located by Grid Coordinates)  or  061-279-2003 (Determine Firing Data Using BCS [Area Mission] for a Target Located by Polar Plot)  or  061-279-2004 (Determine Firing Data Using BCS [Area Mission] for a Target Located by Shift from a Known Point)  or  061-279-2011 (Determine Firing Data for Specific Shell-Fuze Combinations)  • Execute displayed message  - Review Gun Orders  • Transmit Gun Orders  Transmit Gun Orders  Transmit MTO  • Review and Transmit MTO  (Coordinate/Control Fire Request Using FIST DMD)  061-273-1003 (Enter and Transmit Fire Mission	FO(3)	(1 per CO			2 BCS	FD SP (F-3)	2 Ch Sec	4-Guո	AG	ns
Process Fire Commands  TBD (Operate GDU) (Process Fire Command)  061-266-3315 (Determine Safe to Fire)  Prepare Ammo for Firing  O61-266-1506 (Prepare Separate-Loading Ammunition for Firing)  3-1 7-2d  Lay Howitzer for Direction and Quadrant  061-266-2229 (Lay Howitzer for Deflection) 061-270-1215 (Lay Howitzer for Quadrant with Range Quadrant)  or  061-266-3318 (Lay Howitzer for Quadrant with Gunner's Quadrant)  061-266-3315 (Determine Safe to Fire)							─ <del>^</del> ;ф	D		D-0

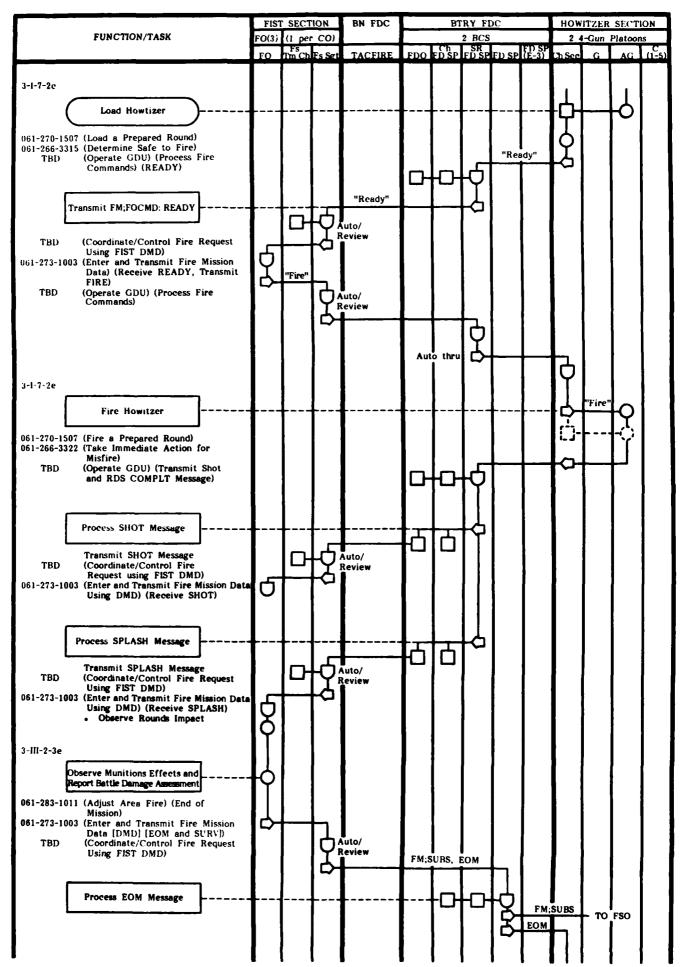












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7-1-7-2a  Process Fire Commands  (Operate GDU) (Receive EOM)  • Process Fire Command							4			<del></del> ф	Ъ	Ð	P
Lay on Planned Priority Target  061-266-2229 (Lay Howitzer for Deflection) 061-270-1215 (Lay Howitzer for Quadrant with Range Quadrant)											<del>\</del>	9	

## 3. Fire-for-Effect, Target of Opportunity, WR, Autonomous

This fire mission flow is depicted in Figure A-5 on the following The mission is assumed to be autonomous and is initiated by the observer by performing the "Locate Target" function. The target location may be determined by performing the supporting SM task or it may be known by a pre-determined target number, i.e., a target or area that has been previously fired upon and an accurate location has been determined; therefore, the location is known and a target number has been assigned. In performing function 3-III-2-3b, Conduct Fire-for-Effect Mission, the observer determines the type of FFE mission and transmits this fire request through the FIST Headquarters to the battery FDC. The fire mission is processed by the battery FDC by performing the following functions: 3-I-6-8d, Coordinate/Control Fire-for-Effect Missions: 3-I-6-7a, Determine Method of Target Attack; 3-I-6-7b, Issue Battery Fire Order; and 3-I-6-8, Determine Firing Data. As in all autonomous missions, the BCS operator transmits the RFAF message to the supported FSO, the gun orders to the howitzer section and the MTO to the observer. The howitzer section performs the following functions in executing the gun orders: 3-I-7-2a, Process Fire Commands; 3-I-7-2b, Prepare Ammo for Firing; 3-I-7-2d, Lay Howitzer for Direction and Quadrant; 3-I-7-2c, Load Howitzer; and 3-I-7-2e, As the howitzers fire, they transmit SHOT. Fire Howitzer. appropriate number of rounds have been fired, ROUNDS COMPLETE is also transmitted to the battery FDC. The battery FDC responds by transmitting the SHOT and, when appropriate, the SPLASH messages. The observer performs function 3-III-2-3c, Observe Munition Effects and Report Battle Damage Assessment, and transmits EOM to the battery FDC. The battery FDC transmits an FM; SUBS message to the FSO and an EOM message to the howitzer section. The section acknowledges and ends the mission by performing function 3-I-7-1g, Lay on Priority Target.

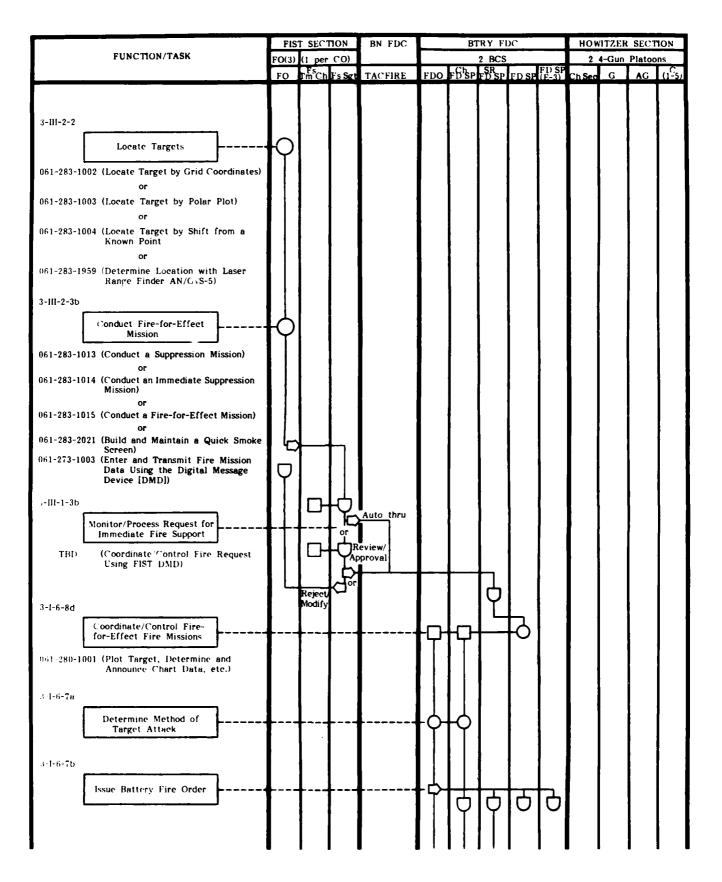
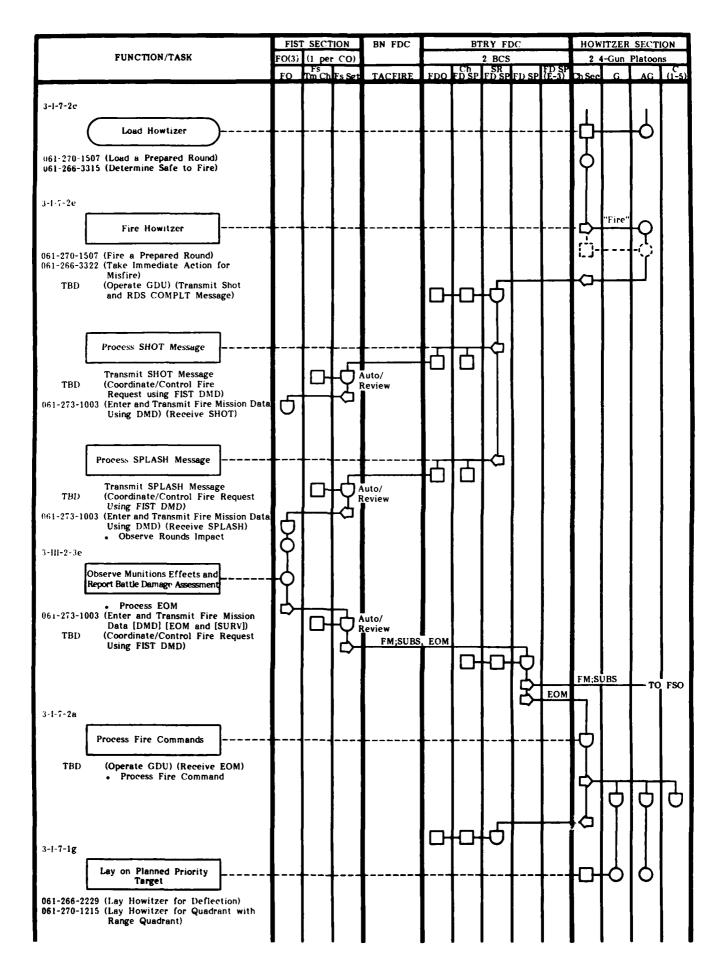


Figure A-5. Fire-for-Effect Mission, Target of Opportunity, When Ready (WR), Autonomous.

			SECT		BN FDC		B	ry F	_		_		SEC1	
FUNCTION/TASK					TACEINE	EDO	ւրբ <sub>ը</sub>			FI) ŞP			_	
FUNCTION/TASK  3-1-6-8  Determine Firing Data  Review displayed FM;RI process in accordance Fire Order  061-279-2002 (Determine Firing Data Usi [Area Mission] for a Target by Grid Coordinates)  or  061-279-2003 (Determine Firing Data Usi [Area Mission] for a Target Located by Polar Plot)  or  061-279-2004 (Determine Firing Data Usi [Area Mission] for a Target Located by Shift from a Point)  or  061-279-2011 (Determine Firing Data for Specific Shell-Fuze Combitions)  • Execute displayed mess  - Review Gun Orders  • Transmit Gun Orders  Transmit MTO  • Review and Transmit M (Coordinate/Control Fire R Using FIST DMD)  061-273-1003 (Enter and Transmit Fire Music)  Data) (Receive MTO)  3-1-7-2a	with  ng BCS t Located  ng BCS et  ng BCS et  Known  r ina- sage	FO(3)	(1 per	CO)	TACFIRE  Auto/ Review			2 BCS	FDSP	:RFAF	2 Ch Sec	4-Gun	AG	
061-273-1003 (Enter and Transmit Fire bata) (Receive MTO) 3-1-7-2a	ire											0	0	0
or  061-266-3318 (Lay Howitzer for Quadran with Range Quadrant)  or  061-266-3318 (Lay Howitzer for Quadrant) with Gunner's Quadrant) U61-266-3315 (Determine Safe to Fire)	nt												- 6 ()	



## 4. Precision Registration, Quick and Time

This fire mission flow is illustrated in Figure A-6 on the following The precision registration is initiated with a registration alert message from the battery FDC (function 3-I-6-9a, Coordinate/Control Registrations) to In performing function 3-III-2-3c, Conduct a Precision Registration, Quick and Time, the observer determines the direction to the registration point and transmits a SYS; PTM message to the battery FDC indicating he is ready to conduct the registration. In performing function 3-I-6-6b, Determine Registration Data, the BCS operator selects the FM; RFAF message and enters and reviews the FDO specified data. Upon execution, the RFAF is transmitted to the FSO, the gun orders to the howitzer section and the MTO to the observer. The howitzer section performs the following functions in executing the gun orders: 3-I-7-2a, Process Fire Commands; 3-I-7-2b, Prepare Ammo for Firing; 3-I-7-2d, Lay Howitzer for Direction and Quadrant; 3-I-7-2c, Load Howitzer; and 3-I-7-2e, Fire Howitzer. Upon firing, a SHOT and ROUNDS COMPLETE message is transmitted to the battery FDC. The battery FDC responds by transmitting SHOT and, when appropriate, the SPLASH messages. The flow that follows illustrates observer, FDC and howitzer section interaction until the observer has achieved a 50 meter bracket and observed two rounds resulting in a range spotting of the opposite direction. This is assumed to have occurred with the third Adjustment. The observer transmit a PREC REG message stating RARP (record as registration point) and continues the mission by requesting a time registration (TIRPT). The battery FDC performs function 3-I-6-6b, Determine Registration Data, in determining the gun orders. is transmitted to the observer and the gun orders are transmitted to the howitzer section. In producing the fires, the howitzer section performs functions 3-I-7-2a, Process Fire Commands; 3-I-7-2b, Prepare Ammo for Firing; 3-I-7-2d, Lay Howitzer for Direction and Quadrant; 3-I-7-2c, Load Howitzer; and 3-I-7-2e, Fire Howitzer. The appropriate SHOT and ROUNDS COMPLETE message is transmitted to the battery FDC. The battery FDC transmits the SHOT and, when appropriate, the SPLASH messages to the observer. In this example, the height of burst (HOB) is determined to be 20 meters. observer continues the mission by requesting three rounds in conducting function 3-III-2-3c, Conduct a Precision Registration, Time. The FDC and howitzer section functions are performed in providing the fire direction support and produce the howitzer fires. The observer ends the mission by transmitting the RATI; EOM (record as time, end of mission) messages. The battery FDC performs function 3-I-6-6b, Determine Registration Firing Data, and transmits appropriate messages to TACFIRE, FSO and the howitzer section. Upon receipt of EOM, the howitzer section acknowledges and performs function 3-I-7-1g, Lay on Planned Priority Target.

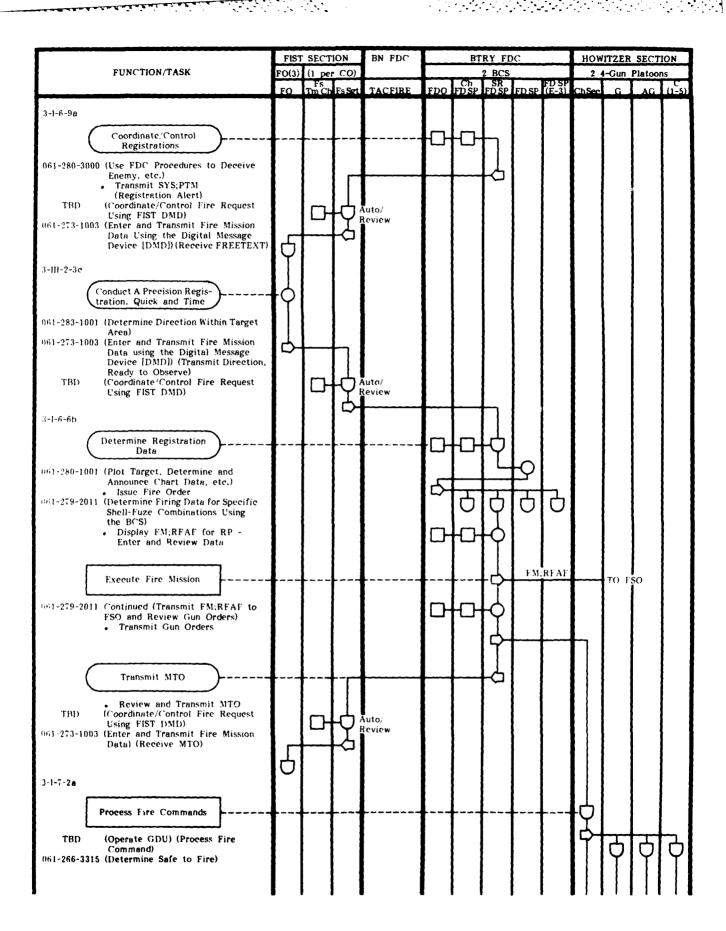
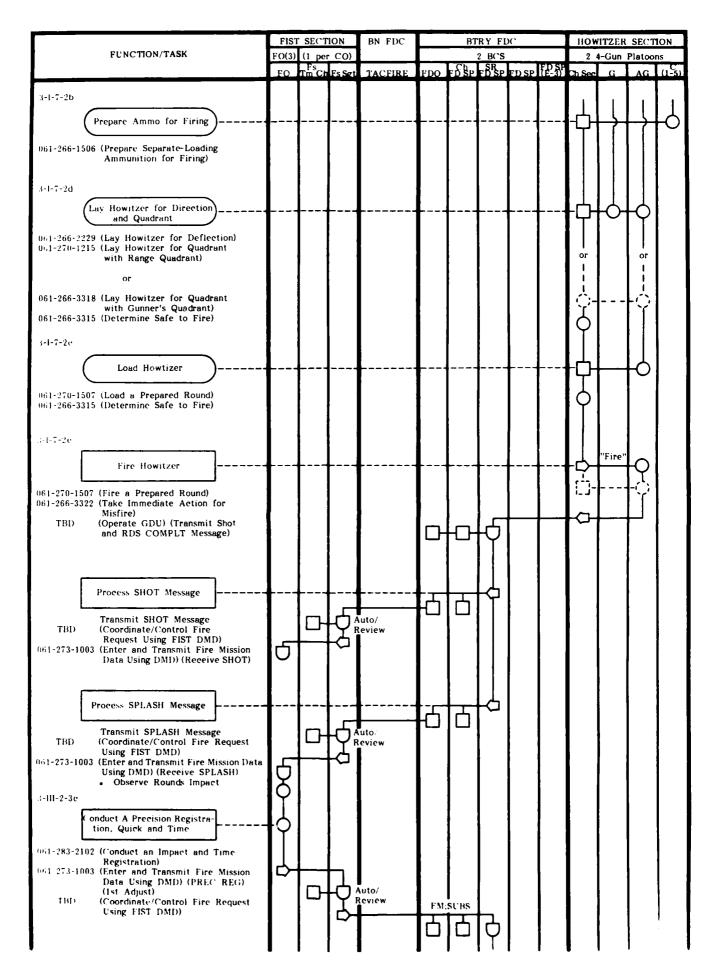


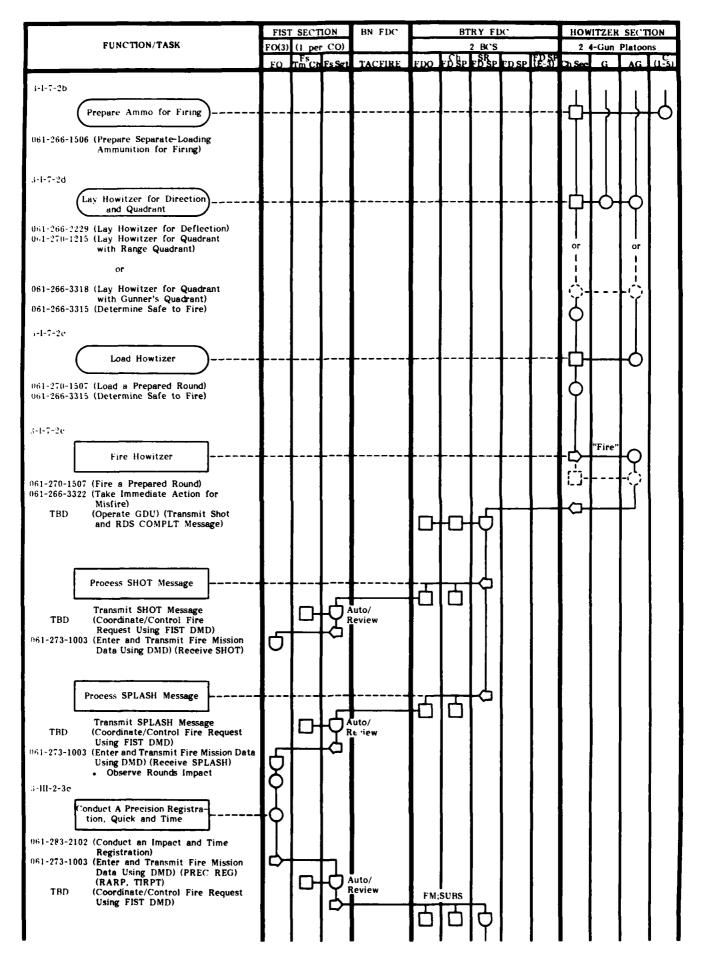
Figure A-6. Precision Registration Mission, Quick and Time.



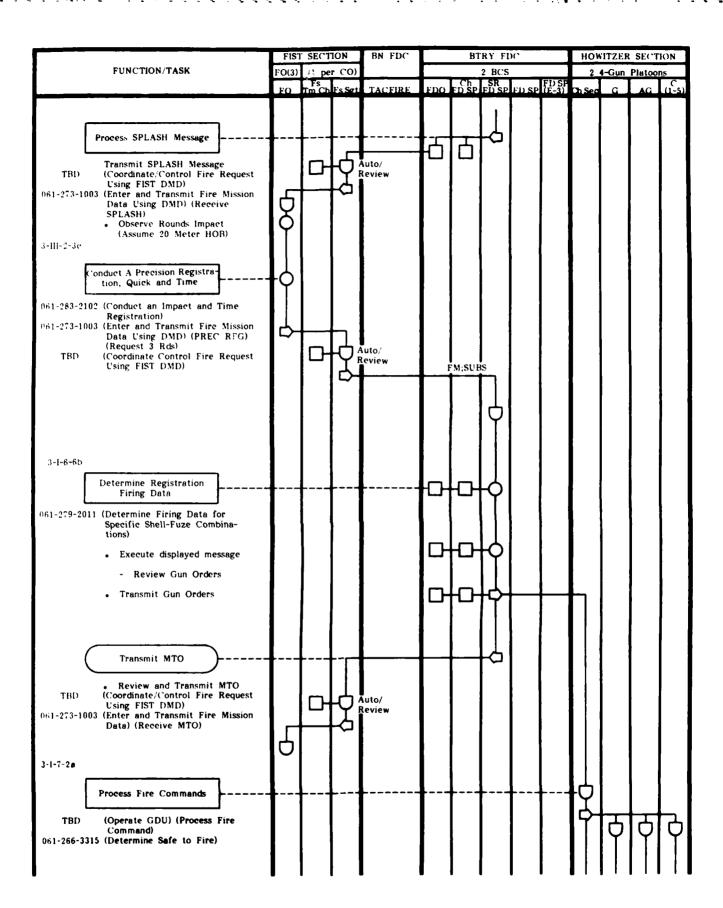
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3-1-6-6b						$\downarrow$						
061-279-2011 (Determine Firing Data for Specific Shell-Fuze Combina-												
tions)  • Execute displayed message						H.						
- Review Gun Orders • Transmit Gun Orders									L,			:
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TBD (Operate GDU) (Process Fire Command) 061-266-3315 (Determine Safe to Fire)										百	P	P
3-1-7-2b  Prepare Ammo for Firing												
061-266-1506 (Prepare Separate-Loading Ammunition for Firing)												
3-1-7-2d												
and Quadrant    10-11-266-3229 (Lay Howitzer for Deflection)     10-11-270-1215 (Lay Howitzer for Quadrant												
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061-266-3318 (Lay Howitzer for Quadrant with Gunner's Quadrant) 061-266-3315 (Determine Safe to Fire)									ှ- ဝ			
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161-270-1507 (Load a Prepared Round) 161-266-3315 (Determine Safe to Fire)									ړ ۲			
7-1-7-2e				i						"Fire"		
Fire Howitzer  061-270-1507 (Fire a Prepared Round)		†	 						ф :::		<del>9-</del> ې	:
061-266-3322 (Take Immediate Action for Misfire) TBD (Operate GDU) (Transmit Shot and RDS COMPLT Message)					o d	ф			Þ			
Process SHOT Message			 	4	7	4						
Transmit SHOT Message (Coordinate/Control Fire Request Using FIST DMD)  061-273-1003 (Enter and Transmit Fire Mission Data Using DMD) (Receive SHOT)	Q.		uto/ eview	J	J							

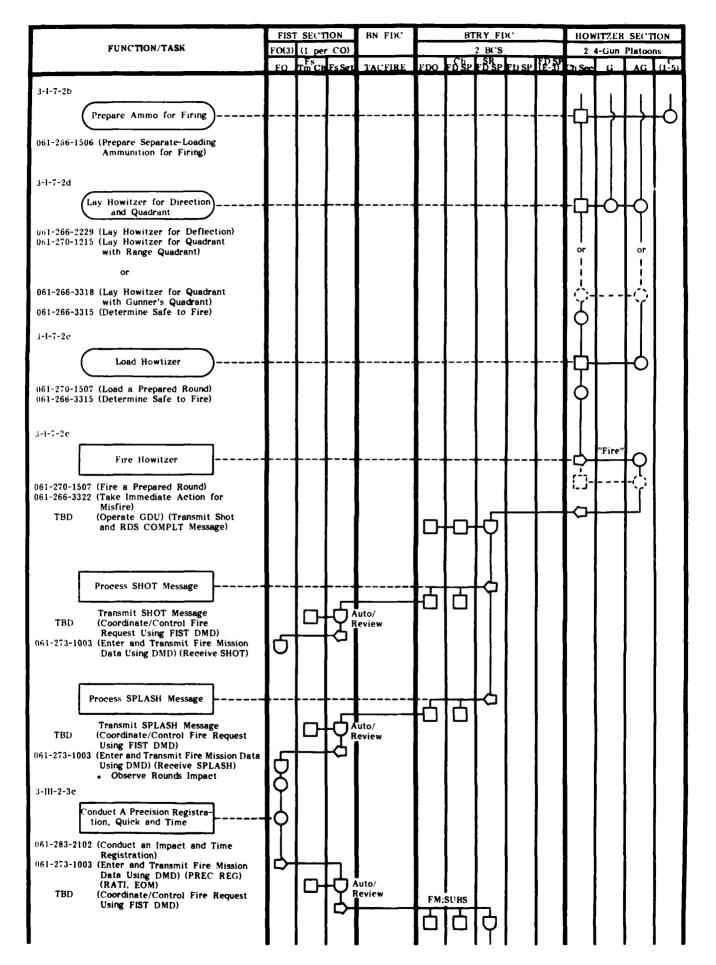
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Process Fire Commands  TBD (Operate GDU) (Process Fire Command)  061-266-3315 (Determine Safe to Fire)  3-1-7-2b  Prepare Ammo for Firing  061-266-1506 (Prepare Separate-Loading Ammunition for Firing)  3-1-7-2d  Lay Howitzer for Direction and Quadrant  061-266-2229 (Lay Howitzer for Deflection)  061-270-1215 (Lay Howitzer for Quadrant with Range Quadrant)  or  061-266-3318 (Lay Howitzer for Quadrant with Gunner's Quadrant)  061-266-3315 (Determine Safe to Fire)										<del>ффффффф-</del>	0	;;	ρ

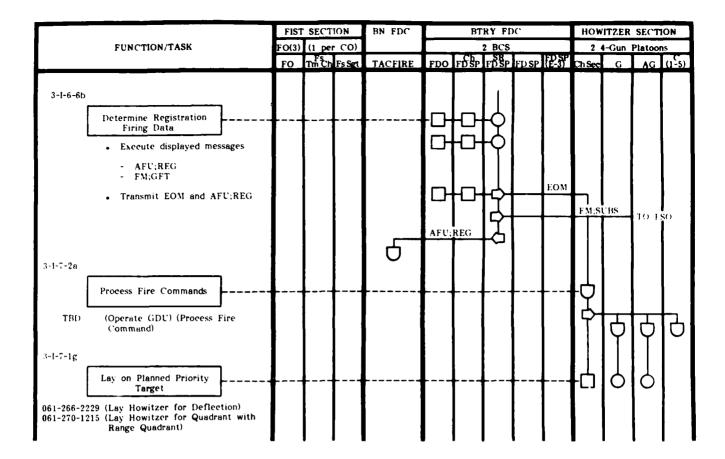
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Load Howtizer								 	굿		9	
u61 266-3315 (Determine Safe to Fire)												
3-1 1-2e Fire Howitzer	ļ				<b>-</b>			 	<u> </u>	"Fire"	0	
061-270-1507 (Fire a Prepared Round) 061-266-3322 (Take Immediate Action for									-		-\{\}	
Misfire) TBD (Operate GDU) (Transmit Shot and RDS COMPLT Message)					<u>D</u> -		þ		ф			
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tions)  Execute displayed message							<b>\</b>					
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	۳								CH SQC		AG	(1-2)
3-1-6-66												
Determine Registration Data	╂						Ю					
061-279-2011 (Determine Firing Data for										İ		
Specific Shell-Fuze Combinations)	ł		i i									
<ul> <li>Execute displayed message</li> </ul>	Į	Į.					Ю					
- Review Gun Orders												
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041-266-1506 (Prepare Separate-Loading Ammunition for Firing)									1	<b>\</b> \ '	\ \ \ '	ł
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(Lay Howitzer for Direction)	·}							<b>-</b>	中	Ю	Ю	
061-266-2229 (Lay Howitzer for Deflection)									1 1		[ ]	l
6-1-270-1215 (Lay Howitzer for Quadrant with Runge Quadrant)			ľ	'					or		or	
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Transmit SHOT Message TBD (Coordinate/Control Fire				uto/ leview								ľ
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Data Using DMD) (Receive SHOT)				A-41				I I	1			l
				ورو رودي					< ·			







## 5. Copperhead, Target of Opportunity Mission, Autonomous

This fire mission is illustrated in Figure A-7 on the following page. The mission is initiated by the FIST, equipped with a GLLD by performing function 3-III-1-6, Locate Targets of Opportunity and Transmit Call for Fire for Upon receipt of the fire request, the battery FDC in the autonomous role coordinates and controls the fire mission by performing functions 3-I-6-7a, Determine Method of Attack; 3-I-6-7b, Issue Battery Fire Order; and 3-I-6-8, Determine Firing Data. The BCS operator transmits the RFAF message to the FSO, the gun orders to the howitzer section and the MTO to the observer. The howitzer section performs the following functions in executing the gun orders: 3-I-7-2a, Process Fire Commands; 3-I-7-2b, Prepare Ammo for Firing; 3-I-7-2d, Lay Howitzer for Direction and Quadrant; 3-I-7-2c, Load Howitzer; and 3-I-7-2e, Fire Howitzer. As the howitzers fire, they transmit SHOT. When the appropriate number of rounds have been fired, ROUNDS COMPLETE is also transmitted to the battery FDC. The battery FDC responds by transmitting the SHOT/DESIGNATE for the first round. observer performs function 3-III-1-6a, Designate a Target of Opportunity for Copperhead, observes the burst and awaits the second SHOT/DESIGNATE. second copperhead round is fired; typically 30 seconds after the first round. The battery FDC transmits the appropriate message to the observer who designates the target. The observer performs function 3-III-2-3c, Observe Munition Effects and Report Battle Damage Assessment, and transmits EOM to the battery FDC. The battery FDC transmits an FM; SUBS message to the FSO and an EOM message to the howitzer section. The section acknowledges and ends the mission by performing function 3-I-7-1g, Lay on Priority Target.

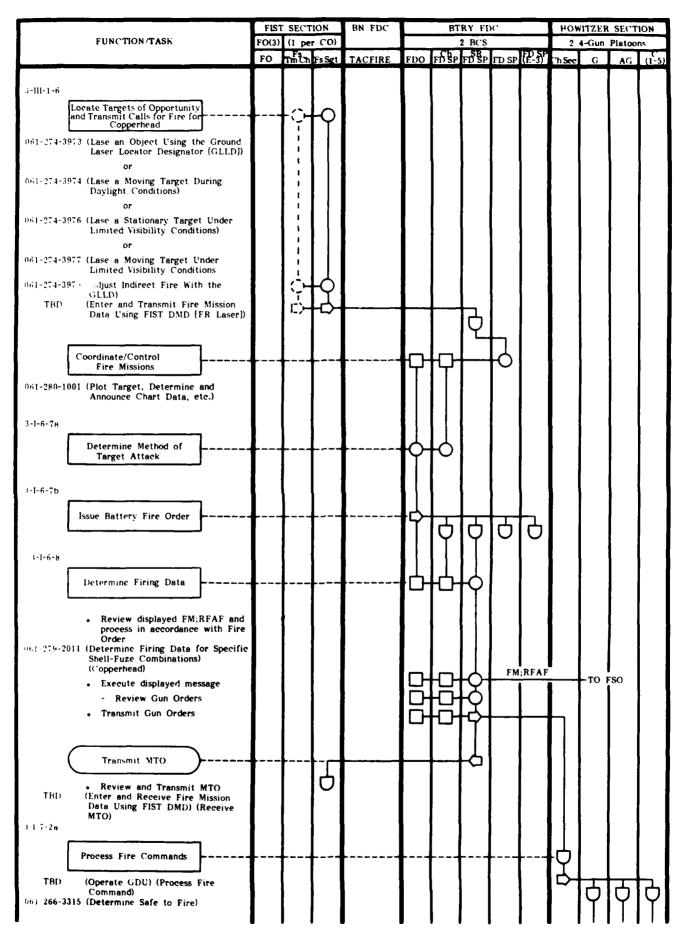
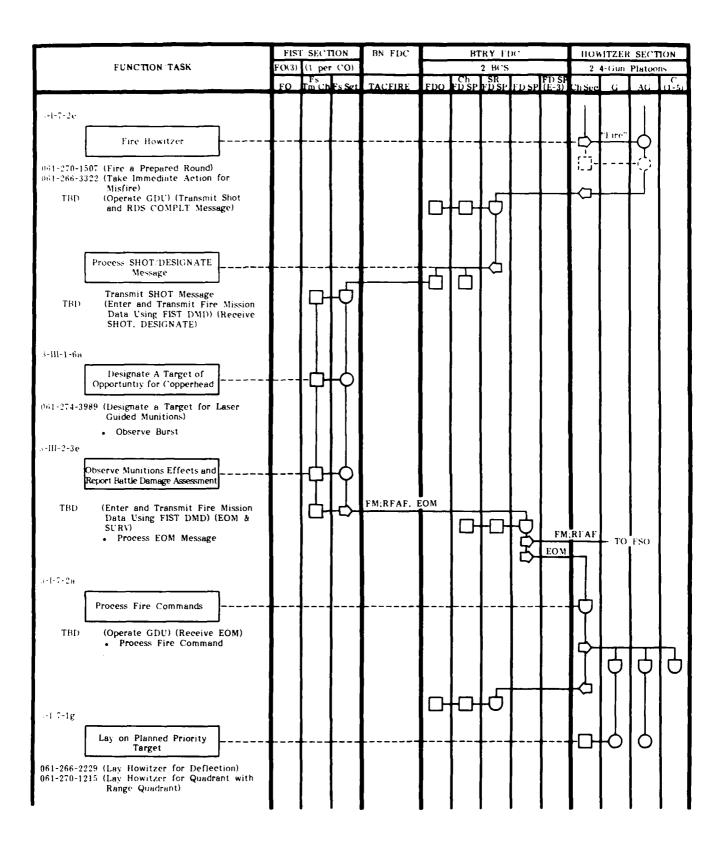


Figure A-7. Copperhead Target of Opportunity Mission, Autonomous.

FUNCTION/TASK POST TO THE MAN TO THE SET OF THE MAN TO THE PROPERTY OF THE MAN TO THE SET OF THE SET OF THE SE	FUNCTION /TACK		r SECT	_	BN FDC			RY FL	OC.			_	SECT	
Prepure Anmo for Firing  US1-266-1308 (Prepure Separate-Loading Annualition for Firing)  I-1-7-26  Lay Howitzer for Direction and Quadrant with Range Quadrant with Range Quadrant with Range Quadrant with Gunner's Quadrant with Gunner's Quadrant with Gunner's Quadrant with Gunner's Quadrant with Gunner's Quadrant with Gunner's Quadrant with Gunner's Quadrant with Gunner's Quadrant of Fire Commandal (READY)  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: READY  Transmit FR-FOCMD: Ready  Transmit Fr-FOCMD: Ready  Transmit Fr-FOCMD: Ready  Transmit Fr-FOCMD: Ready  Transmit Fr-FOCMD: Ready  Transmit Fr-FOCMD: Ready  Transmit Fr-FOCMD: Ready  Transmit Fr-FOCMD: Ready  Transmit FR-FOCMD: Ready  Transmit FR-FOCMD: Ready  Transmit FR-FOCMD: Ready  Transmit FR-FOCMD: Ready  Transmit FR-FOCMD: Ready  Transmit FR-FOCMD: Ready  Transmit FR-FOCMD: Ready  Transmit FR-FOCMD: Ready  Transmit FR-FOCMD: Ready	PURCHON/TASK	FO(3)	Fs Tm Ch	Fs Sot	TACFIRE	FDO			FD SP	EP 87				
Transmit SHOT Message TBD (Enter and Transmit Fire Mission Data Using FIST DMD) (Receive SHOT, DESIGNATE)  3-III-1-6a  Designate A Target of Opportunity for Copperhead  061-274-3989 (Designate a Target for Laser	Prepare Ammo for Firing  061-266-1506 (Prepare Separate-Loading Ammunition for Firing)  3-1-7-2d  Lay Howitzer for Direction and Quadrant  061-266-2229 (Lay Howitzer for Deflection) 061-270-1215 (Lay Howitzer for Quadrant with Range Quadrant)  or  061-266-3318 (Lay Howitzer for Quadrant with Gunner's Quadrant) 061-266-3315 (Determine Safe to Fire)  3-1-7-2e  Load Howtizer  TBD (Operate GDU) (Process Fire Commands) (READY)  Transmit FM;FOCMD: READY  TBD (Enter and Transmit Fire Mission Data Using FIST DMD) (Receive READY, Transmit FIRE)  3-1-7-2e  Fire Howitzer  061-270-1507 (Fire a Prepared Round) 061-266-3322 (Take Immediate Action for Misfire) TBD (Operate GDU) (Transmit Shot	FO(3)	(1 per	r (CO)	TACFIRE				ED SP		2 <b>3 -</b>	Gun G	AG	ns
Observe Burst	Transmit SHOT Message  (Enter and Transmit Fire Mission Data Using FIST DMD) (Receive SHOT, DESIGNATE)  3-III-1-6a  Designate A Target of Opportunity for Copperhead  061-274-3989 (Designate a Target for Laser Guided Munitions)			фф		4	古	4						



### APPENDIX B

### SUMMARY OF INPUT-PROCESS-OUTPUT ANALYSIS RESULTS

### Table of Contents

		Page
INTRODUCTION		B-3
FORWARD OBSERVER FIRE	SUPPORT TEAM TASKS	
061-273-1003	Enter/Xmit FM-DMD	B-7
061-27403973	Lase stationary object	B-8
061-274-3574	Lase moving target	B-9
061-274-3976	Lase stationary target (limited visibility)	B-10
061-274-3977	Lase moving target (limited visibility)	B-11
061-274-3979	Adjust indirect fire - GLLD	B-13
061-274-3989	Designate laser guided munitions	B-15
061-283-1001	Determine direction	B-18
061-283-1002	Locate target - grid	B-19
061-283-1003	Locate target - polar	B-21
061-283-1004	Locate target - known point	B-23
061-283-1011	Request/adjust area fire	B-26
061-283-1013*	Conduct suppressive fire	B-28
061-283-1014*	Conduct immediate suppressive fire	B-28
061-283-1015*	Conduct FFE	B-28
061-283-1021	Request/adjust illumination	B-29
061-283-1952	Operate LRF - normal	B-34
061-283-1959	Determine location - LRF	B-36
061-283-2001	Request/adjust creeping fire	B-39
061-283-2002**	Request/adjust FDF	B-39
061-283-2003*	Request/adjust fire - irregularly	
	shaped target	B-26
061-283-2004	Request/adjust fire (sound)	B-42
061-283-2005	Determine direction - indirect fire	B-44
061-283-2021	Conduct immediate smoke	B-45
061-283-2022***	Build quick smoke	B-45
061-283-2102	Impact/time registration	B-47
061-283-2103*	Destruct mission	B-26
061-283-2205*	Assault fire	B-26
TBD	Control/coordinate fire mission -	
	FIST DMD	D_50

<sup>\*</sup>Included in Task 061-283-1011 \*\*Included in Task 061-283-2001 \*\*\*Included in Task 061-283-2021

### Table of Contents (Cont'd)

			Page
FIRE	DIRECTION CENTER	TASKS	
	061-279-2002	(BCS) Determine fire data - grid	B-52
	061-279-2003	(BCS) Determine fire data - polar	B-52
	061-279-2004	(BCS) Determine fire data - known point	B-52
	061-279-2002	(TACFIRE) Determine fire data - grid	B-57
	061-279-2003	(TACFIRE) Determine fire data - polar	B-57
	061-279-2004	(TACFIRE) Determine fire data - known point	nt B-57
	061-279-2005	(BCS) Replot targets	B-60
	061-279-2011	(BCS) Determine firing data -	
		specific shell/fuze	B-62
	061-279-2016	(TACFIRE) TOT mission	B-64
	061-279-2017	(BCS) Determine quick fire	B-66
	061-279-2300	(BCS) Determine firing data - illumination	B-67
	061-280-1001	Plot/announce chart data	B-72
	061-280-3000	Use FDC procedures to deceive	B-73
	TBD	(BCS) Determine Copperhead Data	B-75
HOW	ITZER TASKS		
	061-266-1506	Prepare ammunition	B-77
	061-266-2229	Set/lay for deflection	B-81
	061-266-3315	Determine howitzer safe	B-82
	061-266-3318	Set/lay quadrant - GQ	B-86
	061-266-3322	Take immediate action - misfire	B-87
	061-270-1215	Set/lay quadrant - RQ	B-88
	061-270-1507	Load howitzer	B-90
	061-270-1507	Fire howitzer	B-93
	TRD	Operate GDII/SCA	R-95

### APPENDIX B

### SUMMARY OF INPUT-PROCESS-OUTPUT ANALYSIS RESULTS

### Introduction

This appendix is included with the GTT description as part of the information about using the trainer. In the body of the report, it is indicated that an instructor should have available descriptions of the fire missions that are to be trained as well as detailed information about each task in the missions. The instructor will plan and oversee the training process using this Also, it will aid in training need diagnosis and readiness information. assessment. Appendix A contains flow diagrams and narrative descriptions of the five selected missions. This appendix contains detailed task information including performance measures, and criteria. These details were produced in an Input-Process-Output (IPO) analysis. That analysis was applied to the baseline system to provide a data base for the definition of training requirements and for the evaluation of training devices. The completed IPO data sheets contain a detailed description of the elements that make up each Soldier's Manual task. The nature of the performance in each element as well as definitions of how each may be observed/measured are also presented. Relevant conditions under which the task is performed are listed and all identified standards of performance are shown. For almost every task, a Training Requirements Index (TRI) is shown. The TRI values range from 25-89; the higher values denote tasks for which a greater expenditure of training resources is justified than for task with low values. The index is a combined indication of difficulty and criticality based on assessment by artillery subject matter experts (SMEs).\* While this index has never proven to be as potent as had been originally intended, it is a convenient basis for distinguishing between tasks when a conflict over training resources is encountered. The TRI is discussed further in the body of this report.

The purpose of the IPO was to identify the specific processes (operator activities) that make up each Soldier's Manual task and to define performance standards and measures associated with each process and task. The IPO was applied to the baseline system and the results are descriptive of that system's performance. The data used in the analysis came from the inventory and evaluation of the Soldier's Manual tasks and the Operational Sequence Diagram completed earlier. In addition, details of performance, especially standards and measures were extracted from appropriate Soldier's Manuals, Field Manuals and the ARTEP Manual for the baseline. From all of these sources, the IPO developed a detailed statement of operator performance which includes what the operator is required to do, how the performance is or could be measured and what means for performance measurement (or assessment) are currently used.

Figure B-1 is a sample page from an IPO for a Cannoneer's task and will serve to illustrate the method. Beginning at the upper left corner, the heading identifies the subsystem (FO/FIST, FDC or Howitzer) in which the task is performed and identifies the crew member (or members) to whom the task is

<sup>\*</sup>There are no TRIs shown for those tasks identified late in the program when the SME review had been completed.

Momittee D					-Harling American	Auciluble			- <del>-</del> 2	7 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
				Ĭ	Fuze Wrench	Fuze Wrencher, Setters Provided That Chamification:	A Tark Cla	sification:		Revision 1 Date: 11/28/83
Section Presidents)	Cannoneers (CZ.3.4.RD)	THE PERSON			Night Lite Device Provide Sec Hand Tools Available	Night Lite Device Provided Sec. Hand Tools Available	200 A 100 A	es Capalu	130 Procedural (Pizzel, Biructured)  I Veriable (Cagnitive, Beni-Bructured) Analyst:	C. Preusser
	Pactors		Inouts		Process	Outputs				
Practicale)/Testes	Affecting	£		Equip	Actions	in a land	Ę	Time	Perfermence Standards	Present
Proper Amen (or 1a) Visibility	1a) Visibility		Fire com-	None	Hear announced	Initiation of task	ខ	00:00	Preparation of ammunition	
Piring (C23,4,HD)	due to dark-		mands-		fire command				task is initiated promptly	
SM Task # & Name ness	ness 5) Weather		announced							
	(snow, rain,			None	C3 Repeat	Repeated shell/	C3,(Self		Shell correctly repeated	Compare repeated shell
Prepare Separate-	sleet)				shell/rounds	rounds	ည် (၁		(SM/TM)	to announced shell
Loading Ammuni-	6) Terrain			Shell	Select shell ac-	၌	: :		Color codes and markings	Compare selected shell
tion for Firing	(desert, jun-				conding to color	cording to an-			on shell selected correctly	to announced shell
(CZ,3,4,HD)	gle, elc.)				ings stenciled on	noniced stell			(mg)	
TRI: 61	Space re-	_			shell and con-					
<u> </u>	striction				tainers					
References/Notes:	9) Personal			Shell	Remove any	Cleaned/undam-	ອ :		Shell is free of any for-	Visually inspect shell
	equipment				sand, dirt, oil or	aged shell	)     		eign matter and is not	for cleanliness
-10	and/or cloth				grease on shell				damaged or corroded (I'M)	
Chapters 2 a 4.	ing including				and inspect for					
GCT-DELL EC •	Kioves and				rosion					
1) All ammunition				Shell	Remove gromme	Remove grommet Cleaned rotating	೮		Rotating band properly	Visually inspect to en-
preparation accom-				Gromme	and examine ro-	bend	Sel Sel Sel		inspected and cleaned	sure rotating band is
plished outside				Rotat-	tating band to				(TM)	free of dirt and burrs
howitzer				<b>8</b>	ensure it is free					
charge menaration					of dirt and burrs					
actions are not				Shell	Visually verify	Shell inspected	ຍ		Shell properly inspected	Observe shell ready
necessarily per-					entire shell is	and held upright	(Self)			for fuzing
formed seguen-					tree of foreign	for fuzing				
tielly					matter/defects					
					and hold shell					
					upright for fuz-					
		Ch Sec	Fire com-	None	C4 Repeat an-	Repeated charge	<u>ن</u>		Charge correctly repeated	Compare repeated
			mends-		nounced charge		(Self)		(SM/TM)	charge to announced
			announced charge (1.2)				Ch Sec			change
				Propel-		Change selected	C4,HD		Charge selected correctly	Compare selected
				lant		according to an-	(Sel		compares to charge an-	charge to announced
				Charge	nounced fire	nounced charge			nounced (TM)	charge
								Ī		

Figure B-1. Sample IPO Analysis Sheet

normally assigned. At the center are listed the prerequisites to initiating the task. These describe the equipment/tools required as well as the status of the system. Next, each task is classified as either a procedural task or a variable task. A procedural task is one which is defined by an inflexible procedure such as loading a howitzer. Procedural tasks usually are related to equipment operation. A variable task is one in which performance is controlled by the crew member. The sequence of performing the tasks elements and the determination that the task has been completed are the responsibility of the crew member. Making a decision is a good example of a variable task. For example, requesting and adjusting fire requires the Forward Observer to evaluate or make decisions about what is seen following no specified procedure. This is a variable task.

The first column on the left contains the name and Soldier's Manual number of the task. At the top of the column (boldface type) is the name of the function of which the task is a subset. These functions are the same as used in the ARTEP (10) and in the current OSD. The function and task names are consistent among the IPO analysis, the ARTEP and the OSD to facilitate indexing among these three documents. Immediately below the task name is shown the Training Requirements Index (TRI) developed in the first part of this study. The TRI is a compilation of four measures of task characteristics that were assigned by subject matter experts during the task evaluation.

Referring again to Figure B-1, the first column on the left is completed with the identification of the documents on which the IPO analyses were based. Most usually this includes the relevant Soldier's Manual and Technical Manual. At the bottom of the first column, there are notes, as required, to clarify the analysis.

The second column of this form is a compilation of factors that affect task performance. These factors were identified by subject matters experts at the Field Artillery School during task evaluation in the first part of this study. These have been compiled in this part of the study to facilitate reference in the definition of training requirements.

The actual Input-Process-Output (IPO) analysis is documented in the remainder of this form. For this analysis, each task has been divided into the several component activities that make up the total task. This division is done empirically, the objective being to define activities that are meaningful work units, that are sensible (i.e., it can be observed by an instructor or can be associated with an equipment function) and, finally, that can be related to a performance criterion of speed and/or accuracy. For example, in tasks involving the use of digital message devices, one activity is simply pushing the Acknowledge key because this can be used to establish response times. in those tasks, "Review Message" is a single activity because it is a functional entity and because time and accuracy measures would be useful criteria and could be implemented. These activities are also relevant to training needs definition because they are functional entities and can be "observed" and measured. When the activities have all been completed, the "process" of the task is finished and a result, or output, is produced. That output denotes the completion of the task and service as input to any succeeding, sequential tasks.

The "Input" column describes the source and content of the stimulus for the process that follows it. Input can be the information needed for the

process, it can be a state of the system or an equipment that is necessary for initiating the process or it can be an operational condition. For example, the receipt of a Fire Message is the stimulus for initiating gun-laying processes and the content of the message provides the data for performing the processes. As another example, the presence of a target is an input to Forward Observer tasks. The input is also identified as to source—which can be a piece of equipment or a person. Input can be generated by the operator performing the task in which case the source is named "self."

The "Process" section of the IPO form describes what the person to whom the task is assigned does with the input or does as a consequence of receiving the input. The equipment, if any, used in the process is also identified.

The "Output" column describes the content and destination of the product of the process. The output may serve to initiate a task performed by the same person or one performed by someone else. It can be input to more than one other task. The output may or may not be tangible. For example, one Cannoneer activity is to hear and repeat a part of the Fire Message as given by the Chief of Section. The Cannoneer's repetition of the Announced Charge, for instance, is the output of the activity "Repeat Announced Charge" and is the stimulus (input) to his actually selecting the powder charges.

The last three columns to the right of the form are concerned with the assessment of performance. The column headed "Time" was included for recording any specified elapsed or cumulative times. For a few tasks, or processes, the ARTEP or the Soldier's Manual stipulates a desired or a tolerable time of performance. Those times are recorded here. The "Performance Standard" is a description of an observable condition or event from which the completion and/or the quality of performance can be judged. Some of these standards appear in the Soldier's Manual and others have been defined in this study. The "Present Assessment Method" simply describes how the standard is or could be observed during system operation.

The IPO data sheets for each of the 58 SM tasks included in the gunnery team engagement process are presented next. The sheets are grouped by FIST/FO, FDC and Howitzer; they are in numerical order in each group.

Page 1 of 1 Pages	Thick Collision 2 Date: 12/8/83	d, Structured)	1 Venickly Committee Committee Committee
Committee of the commit	Prequisites: Lucitation of the Commission of the	tion Position(s) F.O.	

							J Varieb	le (Cognitiv	[ ] Variable (Cognitive, Semi-Structured) Analyst:	J. Hamilton	
	Factors		Inputs		Process	Outputs					
Property (r) (Tocker	Affecting			Equip-	Actions	Conton	É	Time	Dorformungo Standord(s)	Present Assessment Method	
r unccitotits// i asas	reriormance	11011	Contraint	i de la constantia	Coloat Mode and	Men, of monage	3 3	00.00	Communication tock ini-	l è	
	l i visibility	186	Coordinates	UMU	Select Mode and Menu	agassam to nuam	100	00.00	tioted anomatic	tures DD determine	
	darkness	(F.C)	of selected		A neys on DMD	cypes	(2)		uated prompting	tion (coordinates and	
			RP (task 061-							direction) and initia-	
SM Task # & Name 4) Tempera	4) Tempera-		283-2101)							tion of DMD commu-	
061-273-1003	ture/humid-				$\dashv$		**		**	nication	
1	ıty_			UMU	ext	Display advances	e G		rreetext Message format	Observe Freetext	
Enter and Trans-	5) Extreme				DIE	to permit entry	(FC)		Selected Without error	Message format and	
mit Fire Mission	weather				enter FO	of text			(SM)	correct destination	
Data Using the	(snow, rain,				authenticator						
DMD (FO)	sleet)				code and mes-						
					=+				i i		
TRI: 74		<u>=</u>	Recorded RP	QWQ	Ī	Displayed Free-	<u>روا</u>		Coordinates and/or direc-	Compare displayed and	
	hilly, rolling,	(FO)	coordinates		dinates and/or	text Message of	(FO)		tion correctly entered on	recorded coordinates	
References/Notes	mountainous		and/or direc-		direction	RP coordinates			DMD (SM)	and/or direction	
	7) High		tion			and/or direction					
. TM11-7440-281-	communica-			DMD	Press XMIT key	Display cursor	- 	06:00	Message transmitted within		
12 & P (DMD)	tions load					flashing and	(FO),		90 seconds without pro-	task (completion of	
(Chapter 2,	9) Personal				теѕѕаде	XMIT in message	FIST		cedural error (SM)	task 061-283-2101 to	
Pg. 2-97)	equipment					heading.				activate XMIT).	
. TM11-7440-283-	and clothing					Indications of				Observe operator	
12-1-1 (BCS)	(gloves,					message received.				procedure	
(Chapter 3,	mask)										
Pg. 3-37)	10) Opera-										
<ul> <li>SM (FM6-13F)</li> </ul>	tional state										
<ul> <li>This DMD Task</li> </ul>											
Supports Several	tion, target										
Functions	load, com-										
	mander's										
	guidance										
					_						
	_	_	_	_	_	_	_	_	_	_	

Subsystem Fire S	Fire Support Team			Prequ	Prequisites: LIST Established	hed	Task Classification:	sification:		
Section Position(s)	FIST Ch/FS Set	Sert			Digital Comm.	Digital Comm. Established	X Proced	haral (Pixed		U Date: 2/1/54
							( ) Versebl	e (Cognitiv	Analyst:	J. Hamilton
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting	From	Content	Equip-	Actions	Content	Ę	Time	Performance Standard(s)	Present Assessment Method
Designate Target	1a) Visibility	Table 1	Terrain fea-	Binocu-	Sean zone of	Jo	Self		t or	Observe suitability of
of Opportunity for	environmen-	(FIST	ture/object/	lars or	_	_	(FIST			object for lasing. No
Copperhead		Ch/FS	target	any	sighting through		Ch/FS		28	delay from need to
	1b) Visibility	Sg. ()	1	target		for which lasing	Sgt)		lased without delay	lase to actual loca-
	equipment			aequisí-	locate a terrain	data are to be				tion of desired lasing
	2a) Noise			tion		obtained.				point
	equipment			equip-	or target to be					
	environmen-			avail-	Davis					
3	_			able to		Initiation of		00.00		
061-974-3073				7 ISI	Set the nower to	TO DOWPE ON RNG/		00.00	Power and RNG/DES	Observe switch posi-
(FIST (Th/FS Set)	5) Weather			מזיים			(FIST		switches in correct posi-	tion indications
	6) Terrain				_		Ch/FS		tions without error (SM)	
Lase an Object	7) High						Sgt)			
Using the Ground	соттипіся-			GLLD	£	GLLD free to	Self		Azimuth and elevation	Attempt to rotate the
Laser Locator					_	nuth	(FIST		gimbal locks are loosened	GLLD in azimuth and
Designator (GLLD)					gimbal locks	and elevation	Ch/FS		properly (SM)	elevation
Z-M/1/4-Z	ednibment		Tomorin Con		Detete the	Oscaboine on	1100		Croschoire contored on	Observe that orose-
TRI: 61	clothing		ture/object/	מדדה	ator	desired target	(FIST		target (TC, SM)	hairs are on the de-
	10) Opera-		target			129 m 22 m	Ch/FS			sired target
References/Notes	tional state		9		through eveniece		Set.			
					and align cross-		)			
. TC 6-30-1					hairs on desired					
					target					
				GLLD		"LASING" an-	Self		LASING announced just	Hear LASING an-
						nounced.	(FIST		before trigger switch	nounced.
					<u></u>	Azımuth range	Ch/rs		activated. Azimuth, range	Read actual azimuth,
						and clevation	180		and elevation values are	range and elevation
					Switch and read	values are on-			correctly announced (SM)	Values and compare to
					_	Callico				Measure elapsed time
					and elevation:					of GLID operation
					then release					מו מוידו מיבו
					trigger switch					
		_	_	_	_	_		_	_	_

No.

Schools Line Copper Toum	FIST Established		
- III SUMMIT TRAIN	Prequestes: (il.1.1) Oriented	Task Classification:	Revision 0 Date: 2/8/8
Section Position(s) FIST Ch/FS Sgt	Digital Comm. Established	[X] Procedural (Pixed, Structured)	Analyst J. Hamilton

		Factors		inputs		Process	Outputs					_
	· ·	Affecting			Equip-			ı	Time		Present	_
	Function(s)/Tasks	Performance	From	Content	ment	Actions	1	2	minsec	1	Assessment Method	
	Designate Target	1a) Visibility Self	Sel.	Moving target	Binoeu-	Scan zone of	Observation of a	Self		Target is visible (line of	No delay in initiating	_
	of Opportunity for	environmen-	(FIST	in zone of	lars	observation and	moving target.	(FIST		sight) and can be lased	the task once target	_
		101	Ch/EC	observation				Ch/FS			entered zone of	_
	Coppernent	100	21/13	ODSCI ARTIOII		detect/locate		Cart)			observation	_
		(18c signification)	1280			on nashiri Survoui	_	128			HOUSE LACON	_
		equipment				pe lased	Initiation of					_
		2a) Noise						•	00:00			_
		equipment			GTTD	Set the power		<u>.</u>		Power and RNG/DES	Observe switch posi-	_
		Sp. Noise	_			to ON and	RNG/DES switch	(FIST		switches in correct posi-	tion indications	_
		environmen-	_			RNG/DES to	to RNG 1 or 2	Ch/FS		tions without error (SM)		_
		tal				RNG 1 of 2		Set)				_
	SM Task # & Name		_		CLLD	H.	GLLD free to	Self		Azimuth and elevation	Attempt to rotate	_
B	061-274-3974	1					uth	_		ped ped	the GLLD in azimuth	_
-9	(Elet Chice car)	E) Woothon								_	and elevation	_
	196 61/112 1611	6) Terrain						Set)				
	Lase a Moving	7) High			CLLD	Rotate the	Crosshairs on	Self		ed on	Observe that cross-	
	Tarret during	communica-				lator	desired target	(FIST		target (TC, SM)	hairs are on the	_
	Daylight Cordi-	tion load					)	Ch/FS			desired target	_
	tions	a) Dersonel				through eveniene		5			3	
	SION	37 1 CL 301101				candafa Hamania		:				
		namdinba				and angle cross						
	TRI: 74	and/or				hairs on desired						_
		clothing				target				1		-
	References/Notes	10) Opera-			GLLD		"LASING" an-	- Se		St.	Observe/monitor	_
		tional state				ick,	nounced.	(FIST			ability to track target.	_
	TC 6-30-1					pull and hold	Azimuth range	Ch/FS		activated. Azimuth, range	Compare GLLD values	_
						the trigger	and elevation	Set.)		_	to announced values.	_
						switch and read	values are ob-			correctly announced (SM)	Measure elapsed time	_
						the values for	tained and an-			•	for GLLD operation	_
					_	azimuth, range.	nomed				•	_
						and elevation:						
						then release						_
						trigger switch						_
						LIBRET SMITCH						_
												_
												_
						-						_
												_
												_
												_
												_
												_
												_
					_				_			_

					Littory Potabilia	1			Page	Page 1 of 1 Pages
Subsystem				Pred	Prequisites: FIST ESTABLISHED SILED OFFICE W/Night	ed w/Night	Task Clas	Task Classification:	Revision	on Date: 2/11/84
Section Position(s)	FIST Ch/FS Set	egt egt			Sight Installed	lled	IXI Proce	dural (Pixed	(X) Procedural (Pixed, Structured)	-
					Digital Comp	Digital Comm. Established	l J Variat	de (Cogniti	ve, Semi-Structured) Analyst:	it: J. Hamilton
	Factors		Inputs		Process	Outputs		i		ć
Function(s)/Tasks	Affecting Performance	rìom	Content	Equip- ment	Actions	Content	To	Time (minsec)	Performance Standard(s)	s) Assessment Method
Designate Target	1a) Visibility	Self	Stationary	0	With the night	Observation of a	Se		Initiate lasing of target	Observe performance
of Opportunity for	environmen-	(FIST	target in zone		sight set to wide	stationary target			task without delay	
Copperhead	181 15) Visibility	( ) ( )	or observation	I AS-4	(WEOV)	lor which lasing	Cn/rs			
-	for visibility	<u> </u>			zone of observa-	obtained	29			
	2a) Noise				tion and locate a	Initiation of				
	environmen-				stationary target	lasing task	•	00:00		
-	tal			CLLD	With the RNG/	TAS-4 reticle	Self		RNG/DES in correct posi-	
	2b) Noise			W/AN/	DES on RNG 1	aligned on cen-	(FIST		tion. Target is properly	
	equipment			TAS-4	or 2*, place the	ter of target.	Ch/FS		aligned in center of reti-	
					TAS-4 reticle on	Target in focus	<b>2</b> 81		cle. Target in focus and is	
1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	_			-	the center of	and appears to			adjusted for Dest image	set for Dest Illiage
OM 185K # & Name	5) weather				the target and	De at Dest Image			detail. (10)	Detail
016C-#17-100 (FICT Ch/EC Set)					Set tire TOV 18	oi detail				
186 61/110 18111	on mining-				the BANGE					-
Lase a Stationary	tion load				FOCUS to focus					
Target under	9) Personal				image. Adjust					
Limited Visibility	equipment				RRT and CTRS					
Conditions	and/or				for best image					
	clothing				detail	•				
TRI: 74	10) Opera-			GLLD	-	Target type	Self		Target correctly classified	
	tional state			W/TAS-	_	classified.	FIST		and identified. (TC)	classification and
References/Notes				4	track vehicle,		Ch/FS			identification with
TC 6-30-1					etc., and identify	Irlend or loe	) 28			abonotonictios
					while viewing					cilal actel 13thc3
					target					
				GLLD	_	"LASING" an-	Self		"LASING" announced just	
The target is to be	_			W/TAS-		nounced. Azi-	(FIST		before trigger switch acti-	
engaged w/copper-				4	and hold the	muth, range and	Ch/FS		vated. Azimuth, range and	_
he rended using					trigger switch	elevation values	Set)		elevation values are cor-	
ENG 2 covered					and on the GLL,D	are obtained			rectly announced. (SM)	compare to operators
times to ensure					reticle read the					
consistent and					muth range and					
accurate ranging					elevation: then					
data.					release the trig-					
					ger switch					
								_		<del>-</del>

Saturatem FICT				(	FIST Established	hed			Page 1	of 2 Pages
	EICT ("h/EC Cat			Ē	GLLD Oriented w/Night	ed w/Night	Task Clas	Task Classification:	Revision	Date: 2/20/84
Section rostroms)	1131 511/13 9				Sight Installed Digital Comm.	n. Established	( ) Varieb	oural (Fixed de (Cognitiv	[A] Procedural (Fixed, Structured)  [ ] Variable (Cognitive, Semi-Structured)  Analyst:	J. Hamilton
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting	From	Content	Equip-	Actions	Content	To	Time (minsec)	Performance Standard(s)	Assessment Method
Designate Target	┿		Moving target	₽	With the night	Observation of a			Initiate task of lasing a	2
of Opportunity for		(FIST	in zone of		vide	moving target for			moving target under	initiated
Copperhead	tal 1b) Visibility	S (2)	observation	₹	(WFOV) scan	wnien lasting data			without delay	-
	equipment	ۇ م			rva-				•	
	2a) Noise					Initiation of	_	000		
	environmen-				a moving target	lasing task.		00:00	BNG/DFS in correct post-	Observe BNG/DFS
	[8]			W/TAS-			(FIST		tion. Target is tracked	position set for RNG 1
	2D) Noise			W/ 1A3-	or 2 set the	TAS-4 retirle is	Ch/FS		correctly and aligned in	or 2. Tracking skill
CM Tock # A Nome				<u>-</u>		eligned on the	Set)		the center of the TAS-4	can be monitored
061-274-3977					4	center of mass.			reticle. Target is in focus	using the Sony TV
(FIST Ch/FS Set)	5) Weather				reticle on the	Target in focus			and adjusted for best image camera on the GLLD.	ecamera on the GLLD.
	6) Terrain				<b>6</b> 0	and appears to be			detail (TC)	Observe that target is
Lase a Moving	7) High			-		at best image of				in focus and set for
Target under	communica-				ar-	detail.				best image detail
Limited Visibility	tion load				get. Turn the					
Conditions	9) Personal				RANGE FOCUS					
	equipment			_	to focus the					
TRI: 69	and/or				Image. Adjust					
	clothing				for her inger					
References/Notes	110) Opera-				for best image					
L TC6-30-1	and in the second			CLLD	fy target	Target type	Self		Target correctly classified	Compare determined
· } }		_		w/TAS-	as wheeled or	Jenti-	(FIST		and identified (TC)	
				4		fied as friend or	Ch/FS			tification with actual
					_	loe	Set)			known target charac-
					tify as friend or					teristics
					foe while view-					
					ing the target					
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8	Revision Date:	ured) Analyst: J. Hamilton		Performance Standard(s) Assessment Method	before trigger switch ac- nounced. Tracking tivated. Azimuth, range and elevation values are correctly announced trainer set					 		
Thek Clessification:	Procedural (Pixed, Structured)	[ ] Variable (Cognitive, Semi-Structured)		Time (minsec)	<b>1</b> 0				 	 		
	i	Established	Outputs	Content	nounced. Azimuth (FIST range and eleva- Ch/FS tion values are Sgt) obtained while	target			 	 	 	
FIST Established	Sight Installed	Digital Comm. Established	Process	Actions	"LASING." Main- tain smooth tracking. Pull and hold the		range and eleva- tion; then release the trig-	0				
Prequ				Equip-	w/TAS-			ļ		 _	 	
			Inputs	Content					 			
	rt			From						 	 	
	FIST Ch/FS Set		Factors	Affecting Performance						 	 	
Subsystem FIST	Section Position(s) F			Function(s)/Tasks								

FIST					FIST Fetablished	shed				1 of 2 Pages
Services Chief Chief Ser	T Ch/FS Set			Prequ	Propulsites: GLLD Oriented	ted	That Cha	That Classification:	Revision	m Date: 3/27/84
Section Positions) 10/11	190 (1)110 10				Digital Com	Digital Comm. Established		deral (Pined No (Cognitiv	[ ] Procedural (Pixed, Structured) [ ] Variable (Cognitive, Semi-Structured) Analysis	Analyst: J. Hamilton
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	Į.	Time	Performance Standard(s)	Present  Assessment Method
Designate Target	1a) Visibility		Target in	Binoc	Decide to	Initiate task	Seir		Target detected and	ð
of Opportunity for	environmen-		zone of observation	ulars, GLLD	request fire				and correctly classified/ identified	
SM Task # & Name	1b) Visibility	_	(detected,	CLLD.	Perform SM	Target location	JESS		Direction, range and	Lase target and
061-274-3979	equipment		classified,	FIST	task 061-274-	entered auto-			vertical angle values use	
	3) Moving		identified)	DMD	3973.	matically into			correct.	
Adjust Indirect	vehicle				Lase an object	FIST DMD			Distance to nearest 10	
Fire with Ground	4) Temper-					message format			meters, direction and	
Designator (GLLD)	humidity								Bil	
AN/TVQ-2	extremes	_		FIST	Complete	Message format	FDC		Message completed without	1
	5) Weather			DWD	appropriate	completed and	sei Sei		procedural error and	prepared without
TRI: 74	6) Terrain				message format	transmitted			and promptly transmitted	
	7) High				and transmit FM					transmitted
References/Notes	communica-				message					
	tion load	PDC	MTO, Shot	FIST	Read message	Knowledge of	<u>=</u>		Messages processed	Observe performance
• (SM) FM6-13F	9) Personal		and Splash	DMD	contents	message contents			promptly	
Pg. 20290	equipment		messages							
• TC6-30-1	and/or	38	Shell burst	CLLD	Loosen azimuth	Cross hairs on	i Se		GLLD cross hairs centered	red Observe periormance
Section 2	clothing				and elevation				on burst with no delay	
	10) Opera-				symbol locks.					
	tional state				Observe the					_
					burst. Rotate					_
					ciabing theory					
					Signature and according and					
					align cross hairs					
					on burst/smoke					i
				GLLD,	Pull hold the	Direction, range	<u>.</u>		Direction, range and	Observe performance
				FIST	trigger switch	and vertical			vertical angle values are	
_				UMU	and read the	angle values			Automatically filled in on	
					orrection, range,	DMD			risi DMD	
					and vertical					-
					angle values					
								_		
										-

ANALYSES	
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RY TEAM ENGAGE INPUT-PROCESS-OUTPUT (	
AM ENGAGE	
GUNNERY TE	

			CONNEKT	71	ENGAGE INFO	EAM ENGAGE INFUI-FROCESS-OUIFUI (IFU) ANALISE		NAME I	Page 2	of 2 Pages
Subaystem FIST				Prequi	Prequisites: GLLD Oriented	ped	Task Clas	Task Classification:	Revision	Dete
Section Position(s)	FO/FIST Ch/FS Sgt	Set			Digital Comn	Digital Comm. Established	1 J Proced	beral (Pixed) le (Cognitiv		J. Hamilton
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting	From	Content	Equip- ment	Actions	Content	To	Time (minsec)	Performance Standard(s)	Present Assessment Method
			GLLD data on FIST DMD	FIST DMD	Complete subsequent adjust message format and transmit data	Message format completed and transmitted	FDC		Message completed without procedural error and promptly transmitted	Observe message prepared without procedural error
 	1 1 1 1 1	 	ans	sequent	adjustment made	until rounds ± 50 r	neters o	f target.		 
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1	Lase bursts within FFE range and	FIST	Complete FFE message and transmit data	Complete FFE TFE data entered FDC message and transmitted transmit data	FDC	 	 	
B-14			Shot and splash	FIST	Read message contents	Knowledge of message contents	Jie Seit		Messages processed promptly	Observe performance
			FFE bursts	GLLD/ Binoc- ulars	Observe FFE result effective	Transmit EOM and results	FDC		FFE entered by third round EOM and results transmitted without delay	Observe and evaluate FFE and EOM results

Subsystem FIST			;	Banco		ped				
ei) inn(e)	EICT Ch/EC Cat				GLLD Oriented & Focused	d & Focused	Tesk Classification:	Silication:	Revision	Date: 3/20/84
					Digital Comm. Established Copperhead FM In-Process	Established M. In-Process	[ ] Variab	le (Cognitiv	I Variable (Cognitive, Semi-Strittured) Analyst:	J. Hamilton
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip-	Actions	Content	To	Time (minsec)	Performance Standard(s)	Present Assessment Method
Designate Target of Opportunity for Copperhead	<del> </del>	FDC	FIST DMD MSG indicator lamp flashing and audible	FIST DMD	Observe MSG lamp flashing and hear beep	Initiation of task	3 E 5 3	00:00	MSG light observed; beep heard	Observe performance
SM Task # & Name 061-274-3989 (FIST Ch.FS Sgt)			FIST DMD MTO message w/mission information	FIST DMD	Press MSG key and read message display. EEI to include Copperhead Time of Flight (TOF), Volume of Fire, and Copperhead PRF code	Knowle mission EEI (T Volume and Pl	Self (FIST Ch/FS Sgt)			Observe MSG indicator lamp, audible beep off and displayed MTO
Designate a Target for Laser Guided Munitions TRI: 61	ttion load  9) Personal equipment and/or clothing 10) Opera-	Self (FIST Ch/FS Sgt)	MTO-message content on FIST DMD	GITD	Prepare GLLD for designate mode. Set mode to DES. Set desired PRF indicator codes	GLLD mode to DES. PRF codes set	Self (FIST Ch/FS Sgt)		DES mode properly set. PRF code indicator set to desired code (SM)	Observe mode set to DES, Compare desired PRF code w/actual set code
References/Notes - FM6-13F (Pg. 2-295) - TC6-30-1	tional state	FDC	FIST DMD MSG indicator lamp flashing and audible beep	FIST DMD	Observe lamp flashing and hear beep	Knowledge that MSG must be acted upon	Self (FIST Ch/FS Sgt)		MSG light observed; beep heard	None until MSG key pressed. Observe MSG indicator on; hear beep
(Pgs. 52-61) Functional Description			FIST DMD FOCMD- READY mes- sage	FIST	Press MSG key and read message display	I .	Self (FIST Ch/FS		MSG key is pressed promptly	Observe MSG indicator lamp audible beep off READY message dis- played
FDT&E-FIST DMD June 1982  *If obscured, wait until observed or select another target within planned Copperhend footprint and continue the mission		Self (FIST Ch/FS Sgt)	Target visi- bility	GLLD	Sight through the eyepiece and if moving, track target and observe target not obscured.* If target stationary, determine not obscured	Target is visible or target is not visible and new target within footprint can be fired upon	Self (FIST Ch/FS Sgt)		Track and sight moving target (not obscured) promptly. Or if obscured, select new target in vicinity of Copperhead footprint promptly	Observe target obscured/not obscured. Observe target to be fired upon is within Copperhead footprint

Subsystem FIST				Press	FIST Established	hed	Beat. Classification.	i Grant Inn.		
Section Position(s)	FIST Ch/FS Set	<b>.</b>			GLLD Oriented & Focused	ed & Focused	ivi Process	Man ( Divine	Revision	Date: 3/20/84
					Copperhead FM In-Process	Copperhead FM In-Process	( ) Variabl	e (Cognitiv	Variable (Cognitive, Semi-Structured) Analyst:	Analyst: J. Hamilton
	Factors		fnouts		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	2	Time (minsec)	Performance Standard(s)	Present Assessment Method
				FIST DMD	Prepare and transmit FOCMD- FIRE message	RE ans-	်စ္က ြင္လ		Message prepared w/o error and transmitted promptly after decision target is visible	Observe message pre- pared w/o error and transmitted promptly
cation, FIST Ch/FS Sgt initiates manual countdown		FDC	ACK indica- tion on FIST DMD	FIST DMD	Observe TOF counter** count- ing down		Self (FIST Ch/FS Sgt)		Observe auto-TOF countdown or initiated manual countdown promptly	Observe countdown initiated (auto/manual)
on FIST DMD		Self (FIST Ch/FS Sgt)	Target direction and moving/stationary	GILD	Sight through eyepiece, and position the crosshairs on the target aiming point. If target moving, maintain a tracking rate by applying	GLLD crosshairs on target aim point. Tracking target, if neces- sary. Countdown continued	Self (FIST Ch/FS Sgt)		Crosshairs on best aim point. Smooth, accurate tracking maintained, if target moving. Countdown maintained accurately	None, other than cbserving countdown and operator sighting through GLLD
					smooth horizonta and vertical cor- rections to the handle on the traversing unit. Continue to monitor TOF					
signal not observed, operator initiates designate.  If TOF =/< 20 sec., start designate at FOCMD-				GLLD	Observe count- down at 20 sec- onds and GLLD reticle illumi- nated*** to indi- cate start designate	Knowledge that countdown at 20 seconds. GLLD reticle is/is not illuminated	Self (FIST Ch/FS Sgt)		Countdown correctly maintained. Detection observed to start designate. Smooth accurate tracking and designate maintained	(Same as above)
FIRE ACK	-			GLLD	Continue to position cross-hairs on target aim point and squeeze trigger	Target being designated	Self (FIST Ch/FS Sgt)		Target designated accurately until round impacts	Observe operator squeezing trigger
								<del></del>		

C. C. C. C. C. C. C. C. C. C. C. C. C. C			}		FIST Established	shed				Page	of 3 Pages
COLUMN SANGER	9 93/ 40 mata			Predu	Prequisites: GLLD Orient	GLLD Oriented & Focused	Task Classification:	sification:		Revision	Date: 3/20/84
Section Positions)	FIST CA/FS SET				Copperhead	Digital Comm. Established Connerhead FM In-Process	X) Proced	here) (Pixed) e (Cognitiv	X  Procedural (Pixed, Structured)     Variable (Cognitive, Semi-Structured)	Analyst:	J. Hamilton
	Factors		Inouts		Process	Outputs				r	
Function(s)/Tasks	Affecting	E CO	Content		Actions	Content	2	Time	Performance Standard(s)	- (s)	Present Assessment Method
****Typically 2	Let 10 mance	Self	Observe round GLLD	GLLD	Observe burst	Burst observed.	1		Smooth, accurate tracking	Т	Observe effects on
rounds are fired		(FIST	impact/burst	_	and continue to		(FIST		maintained while designat-		target
		Ch/FS			designate for any		Ch/FS		ing. Designate continued	ed ed	
		Sgt)			additional shot	continued to be	% %		until rounds complete (SM)	(WS)	
SEASTINE CA/PS		, los	Observe ef-	GI.I.D.	Observe effects	Target effect	FDC		Correctly observed effect	Т	Observe and evaluate
Set decision to		(FIST	fects on tar-	FIST	on target. Cease	achieved/not	Self		on target. EOM transmitted effect on target.	nittedle	ffect on target.
regiment additional		Ch/FS	vet	DWD	designate and	achieved, EOM	(FIST		promptly and correctly	_	Timeliness of EOM
CPHD rounds if		Set)			target tracking.	transmitted to	Ch/FS		•		transmitted
effects not		<b>-</b>			Enter "X" and	FDC if	Sgt)			_	
achieved					transmit EOM	achieved****					
								···			

TOLD				•	Observation Post Occupied	ost Occupied				
2				Prequisites:		Digital/Voice Comm. Established		sification:	Revision 1	1 Date: 12/9/83
Section Position(s)	FO				FO Equipment Available	Available oint Known	X. Proces	heral (Pixed le (Cognitiv		J. Hamilton
					Thomas	The state of the s				
	Factors		monts		rrucess	Continue		Time		Present
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	To	i iiile Iminseci	Performance Standard(s)	Assessment Method
Perform Observa-	_	FDC	ing	DMD	Observe DMD	Initiation of task	Self	00:00	MSG light observed, beep	Observe performance
tion	due to: fog.		MSG light and		MSG light flash-		(FO)		heard (TM)	
	haze, smoke,	-	audible beep		ing and hear					
	darkness,	0	, , , ,	2	daad	Danding of MCC	1100		MSG key is present	Observe MSG light and
SM Task # & Name	terrain mask-r DC	ے۔ ک	FIM message	OMU.		Regular to conduct(FO)	(FO)		promptly (TM)	beep extinguished.
061-283-1001	Pug Wickinian		to conduct			registration on	) ;			Observe interval MSG
	10) VISIDILITY		quick and time			known point.				light-MSG button
tion within the	equipment		e known point			Ack to FDC.	FDC			
Target Area (FO)	Binoculars.	Ferrain	Knowledge/	Terrain	Identify known	dentification of	JI₹S		Correct identification/	Compare identified KP
	ļ	Sketch/	Awareness of	Sketch/	point on terrain	the desired RP	(FO)		selection of desired KP	with desired KP data
TRI : 74	cle. BC	rarget	known regis-	Trig	sketch or from	from other known			(known point) (FM)	
	Scope. Laser	rig.	tration point	List of	list of known	point targets				
References/Notes	Range FinderList	List	(information)	Known	data as the	within zone of				
	2) Noise			Points	desired RP	observation			1	
. TM11-7440-281-	_	Terrain	Selected fea-	M2	Using M2 com-	Indications of	Je (		Azimuth to RP correct to	Measure azimuth to
12 & P (DMD)		Environ-	Environ-ture/object as	сошрвяз		azimuth reading	(FO)		the nearest 10 mils (5m)	INF BIND VETILY BZIIIIUUIII
(Chapter 2,		ment	RP	-	ec-	to RP				Sucas
Pg. 2-97)	5) Weather				tion) to KP	D. 4	0100	1.00	Dissotion to known point	Measure time for total
. TM11-7440-283-	(snow, rain,			renell,	Record direction Determination	Determination	(60)	90.1	RP correct within + 10	task and verify direc-
12-1-1 (BCS)	sleet)			raper/	נס אר	and recording of	(2)		mile (SM)	tion
(Chapter 3,	6) Terrain			Terrain		direction to Kr.				
Pg. 3-37)	(flat, rolling,			Sketch		IIIIIIIIIII OI IRSK				
SM (FM6-13F)	hilly, moun-					5001-572-190				
. FM 6-30,	tainous),									
Chapter 3	availability,									
(Sec. 1 & 11)	of suitable									
	registration									
	features									_
	10) Opera-									
	tional state									
	-enemy ac-									
	tion, number									
	of targets,									
	commander's									
	guidance									
_										
										_

FIST

Subsystem

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Page 1

The state of the s

target location on map Assessment Method Observe performance Observe and compare Measure direction to Measure distance w/ Measure distance w/ GLLD and compare target and compare LRF and compare Date: 3/21/84 Present J. Hamilton Direction to target within 100 mils of actual direction expressed to the nearest 10 mils rate to within + 10 meters (FM) Performance Standard(s)
Target detected, correctly
classified and identified Target located visually in appropriate grid square Distance (range) to target accurate to within + xx meters Revision Analyst: Distance to target accu-[X] Procedural (Fixed, Structured) [ ] Variable (Cognitive, Semi-Structured) minsect Task Classification: Time (FO/ FIST Ch/FS Sgt) Self (FO/ FIST Ch/FS Ch/FS Sgt) Ch/FS Sgt) Ch/FS (FO/ FIST (FO/ FIST Sgt) (FO/ FIST Self Self using OF, orient ing of target OF on map. location in appro-Plot azimuth andpriate grid via OF and map-square Visual interpolat-Range in meters Content nitiation of task meters to target target recorded Outputs to the nearest 10 mils Prequisites: OP Occupied
Digital Comm. Established
LRE/GLLD Operational Direction to Distance in target perform task and If LRF available, 283-1001 (Deter-SM 061-274-3973 (Lase an Object within Target Area) to the de-283-1952 (Operate the LRF) to locate target by record SM 061able, perform task and record terrain analysis, grid coordinates map spot fea-ture where tartance to target mine Direction record SM 061-If GLLD availdetermine disif only map, Perform and sired target Actions Decision to W/GLLD) rocess Equip-ment Binocu-lars GLLD/ LRF Paper, Pencil M2 Compass, OF Fan, Map classified and Target in zone of ob-Content identified servation detected, Inputs FIST Ch/FS Sgt) FO/FIST Ch/FS Sgt Self (FO/ Performance 1a) Visibility 1b) Visibility environmentional state 5) Weather 6) Terrain environmencommunica-Affecting 10) Operaequipment 2a) Noise 9) Personal equipment Factors tion load 7) High clothing and/or tal ta] SM Task # & Name 061-283-1002 4 rect Pire Missions Locate Targets and Conduct Indi-Locate a Target by Grid Coordi-nates Function(s)/Tasks References/Notes SM (FM6-13F) FM6-30 (Pgs. (FO/FIST Ch/FS Section Position(s) Pg. 2-11) 1, 4-2) TC6-30-1 7 TRI:

get is located

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Revision Date: 3/21/84 Analyst: J. Hamilton		Present Assessment Method	රි.ම සි	Measure time from start to task completion. Determine grid coordinates and compare values	
Thak Classification:  Revision  [X] Procedural (Fixed, Structured)  [ ] Variable (Cognitive, Semi-Structured)  Analyst:		Performance Standard(s)	Target location associated with correct feature on the map	Determine six-digit coordi- Measure time from nate of the target location start to task complewithin 30 seconds tion. Determine grid coordinates and compare values	
Task Classification: [X] Procedural (Flxed, [ ] Variable (Cognitive)		Time (minsec)		00:30	
Task Class [X] Proced		To	Self (FO/ FIST Ch/FS Sgt)	Self (FO/ FIST Ch/FS Sgt)	
n. Established perational	Outputs	Content	Target location Self identified on map (FO/ FIST Ch/F	Determination of a six-digit coordinate of actual target location	
Prequisites: OP Occupied  Digital Comm. Established  LRE/GLLD Operational	Process	Actions	Plot the distance and direction from own location to the target on the map	ye or by coordinate determine git grid ion to tar-	
Prequi		Equip- ment	Map, Plot- ting Equip- ment	Coordi- nate Scale, Mep	
	Inputs	Content	Distance in meters deter- mined by LRF/GLLD	Target loca- tion on map	
h/FS Sgt		From	SCHOOL		
FO/FIST Ch/FS Sgt	Factors	Affecting Performance			
Section Position(s)		Function(s)/Tasks			
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TCI L massagem	Sul and Estate Out		Predm	Prequisites: Of Comm. Established	Established	Task Classification:	fication:		Revision	Date: 3/23/84
Section Positionis)	ro/risi cii/rs	170		OP Location Known to LRF/GLLD Operational	OP Location Known to EDC LRF/GLLD Operational	IXI Procedu	rel (Pixed, (Comitive		Analyst: J.	J. Hamilton
	Factors	Inouts		Process	Outputs				_	
			Ι.			Γ,	Time			Present
runetion(s)/Tasks	Performance From	Т	ment	Desirion to		0 510	musec	Terror detacted gomeoutly	Т	Assessment method
staffin at a soor	environmen- (FO/	get in zone of lars	lars	locate target by	ווונומנוסוו סו נמסע	(FO/		classified and identified		onset we pet tot manice
SM Task # & Name tal				polar plot		FIST				
061-283-1003	Visibility					Ch/FS				
(FO/FIST Ch/FS	equipment Sgt)	classified, and				Sgt)	1		╛	
Sgt)	2a) Noise	identified	M2		Direction to tar-	Self		Direction to target within	_	Measure direction to
6	environmen-		Com-	record SM 061-	get recorded to	(FO)		100 mils of actual direc-		target and compare
Locate a larget	1681		pass,	<u>.</u>	the nearest 10	101		tion expressed to the	<u>~</u>	san I
by Polar Plot	5) Weather		Paper,	mine Direction	mils	Cn/rs		nearest to mils	_	
TRI. 74	7) High		ניוניוו	Area) to the de-						
	communica-			sired target						
References/Notes	tion load		GLLD/	If LRF available, Distance in		Self		Distance to target accu-		Measure distance w/
	9) Personal		LRF	perform task and meters to target	arget	(FO/		rate to within + 10 meters		LRF and compare
SM (FM6-13F)	equipment			record SM 061-		FIST		(FM)		values
(Pg. 2-12)	and/or			283-1952 (Oper-		Ch/FS				
. FM6-30 (Pg. 3-4) clothing	clothing			ate the LRF) to		Sgt)	_			
	10) Opera-			determine dis-		•				
	tional state									
					ers	Self		Distance (range) to target		Measure distance and
		_			to target and	(FO/		accurate to within + xx		vertical angle w/GLLD
	_				observer to tar-	FIST		meters; vertical angle	<u>₩</u>	and compare values
				_	get vertical	Ch/FS		+ xx mils	_	
			,	(Lase an Object	angle	Sgt)				
-			0F	aD.	Visual interpolat-	Jes		Target located visually in		Observe and compare
			Fan.	ent	_	(FO/		appropriate grid square		output
			Мар		location in ap-	FIST				•
<del></del>		-		and	propriate grid	Ch/FS				
				via OF and map-square	square	Set)			_	
				terrain analysis,					-	
				map spot feature					_	
				where target is		_				
				located						
				-			•			
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Pict. Bright					OP Occupied				2	Page 2 of	r 2 Per
	FO/FIST	Ch/FS Set		1	Digital Comm. Established	. Established	Tesk Cleasification:	sification:		Re: salon	Date: 3/23/84
Section rotations)					OP Location Known to LRF/GLLD Operational	OP Location Known to FDC LRF/GLLD Operational	Variable	e (Cognitie	A] Procedin (Fixed, Structured)   Ana.	Analyst: J.	Hamilton
	Factors		Inputs		Process	Outputs				- 	
Function(s)/Tasks	Affecting Performance		Content	Equip- ment	Aetions	Content	<u>1</u>	Time Iminsec	Performance Standard(s)	J(s)	Present Assessment Method
		100	Distance in	Map,	Plot the distance Target location	-	Self (FO)		Target and location asso-		Observe and compare
		FIST	meters deter-	ting	from own loca-				on the map		tion
		Ch/FS Set)	LRF/GLLD	Equip- ment	tion to the tar- get on the map		Ch/FS Set)		,		
		) D	or		or						
		· •	Target loca- tion on map	Мер	Estimate dis- tance to target	Estimated dis- tance to target			target within + 250 meters		Measure distance and compare values
			T	100	Dotom Sir	Vontion chift IID			(SM) When determined vertical		Mensure vertical chift
dispend			tude	Map, Binocu-	cal shift UP or				shi xpressed to the		and compare values
				lars	DOWN if obvi-	mined/ NOT		-	nearest 5 meters (FM)		•
					ous, by map	required					
					Inspection (dif-						
					get elevation						
					and observer						
		<u> </u>		Paper	elevation) Record direction and	Direction and		00:30	Target location determined	_	Measure time from
				Pencil	and distance to	distance to tar-			within 30 seconds (SM)	_	start to task comple-
						get recorded					tion
					Q						
	···									<del></del> -	
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Subsystem FIST				Prequis	isites: OP Occupied		Task Cles	Task Classification:			
Canting Brailing(s)	FO/FIST Ch/FS Set	Set			Digital Comp	Digital Comm. Established	Property I	here! (Pixed		Kevision	Dete: 3/26/84
					Shift Points Identified	perational Identified	[X] Variab	le (Cognitiv	X Variable (Cognitive, Semi-Structured)	Analyst:	J. Hamilton
	Factors		Inputs		Process	Outputs		i			
Function(s)/Tacks	Affecting Performance	From	Content	Equip-	Actions			Time (minsec)	Performance Standard(s)	ard(s)	Assessment Method
Locate Targets	1a) Visibility Self	Self	Target in zone Binocu-	Binocu-		Initiation of task			Target detected; correctly	rrectly	Observe performance
and Conduct Indi-	environmen-	(FO/	of observation lars	lars	cate target by		(FO/	00:00	classified and identified	Dali	
reet Fire Missions	1b) Visibility	Ch/FS	classified and		known point	_	Ch/FS				
	equipment	Set)	identified				Sgt)				
	2a) Noise	)		Binocu-	Scan zone of ob-Known point	Known point			Shifting point known to	ı to	Observe and compare
	environmen-		ر و م	lars	70	selected			both FDC and observer	ver	selected known point
	tal		servation		identify and				and is in proximity of	5	Irom available known
SM Task # & Name 5) Weather	5) Weather				select known				target location		point
061-283-1004	6) Terrain				point in proxi-						
(FO/FIST Ch/FS	7) High				mity of target						
(1.3%	communica-			-	┪				;		1
	tion load		Known point	_	ure the				Angular deviation from the	om the	Measure deviation and
Locate a Target	[9) Personal		data (name,	Sketch/	_		(FO/		known point to the UT	5	compare values
by Shift from a	equipment		direction, dis-	Known	Ξ	known point to	FIST		nearest I mil		
Known Point	and/or		tance, alti-	Point		the OT line	Ch/rs				
	clothing		tude). Target	Data	known point to		(18 <sup>6</sup> C)				
TRI: 74	10) Opera-		in zone of	(j.e.,	the OT line with						
	tional state		observation	target	Dinoculars						
References/Notes				list), Binomi-							
SM (EME-13E)				lars -							
FM6-30				Binocu-	Determine the	Observer to tar-			OT direction recorded to	ed to	Determine direction
				lars,		get (OT) direction			the nearest 10 mils		and compare values
Wienel obsessetion				Terrain							
If GIID see (B)				Sketch/	the angular devi-						
				Known	ation to the						
10 7 3 N				Point	known direction						
				Data	if the target is						
				(i.e.,	to the right of						
				target	the known point						
				list)	or subtracting						
					the angular de-						
					viation from the						
					Known point di-						
					rection if the						
					left of the known						
					point. Record						
					direction to						
					negreet to mins						

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Carolina maiologa	EO/FIET Ch/FC Cat	/FC Cart		Prede	Prequisites: Digital Comm. Established	. Established	Task Class	Task Classification:		Revision	Date: 3/26/84
Section Positions)	ro/risi cii	180 01			LRF/GLLD Operations Shift Points Identified	perational dentified	X Verseb	dural (Pixed te (Cognitiv	( ) Procedural (Pixed, Structured) [X) Variable (Cognitive, Semi-Structured) Anal	Analyst: J.	J. Hamilton
	Factors		Inputs		Process	Outputs					
   Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	2	Time (minsec)	Performance Standard(s)	J(s)	Present Assessment Method
				дттр	В и сегр				Direction recorded to the		Lase target w/GLLD;
					available, per-	get			nearest 1 mil	2 3	read and compare values
					output of SM					-	
					061-274-3973						
					(Lase an Object w/GLLD)						
		Self	Determine an-	Binoeu-	_	Lateral shift				ಽ	Determine lateral
		(FO/	gular devia-	lars,	record lateral	(left/right)			the nearest 10 meters		shift and compare
		FIST Ch/EC	tion in mils	Paper,	from the known	recorded in			(IMC)	<u>&gt;</u>	values
		Set)	tance (R) to	Terrain	point to the OT					_	
		,	known point	Sketch/	line by:						
				Target	Using mil re-						
				Dete:	W - Ryd					_	
				(i.e.	determine W						
				target	to the nearest						
				list)/	10 meters						
				GLLD/ LRF							
		Self	Known point	Binocu-	Determine and	The difference	Self		Range change (add or drop)	ğ	Use method observer
		(FO/	distance, if	lars,	record distance	between the	(FO/		from the known point to		uses; determine and
		FIST	GLLD dis-	Мар	in meters be-	known point and	FIST		the target to the nearest	_	compare values
		Ch/FS	tance to tar-		tween known	the target	Ch/FS		+ 100 meters (SM)		
		128	get. Target in		point and target.		3				
			servation		range from						
					known point dis-						
					tance to target						
					and calculate					-	
					meters or						•
					b) If GLLD,LRF:			-			
					Determine dif-						
					ference between						
					actual GLLD						
*					range to target						
					and range to			-			
					Allowii Pollit						
_	_	_				_	_	_		_	

Sebayatem FIST				į	OP Occupied	!		;			
eltionds)	FO/FIST Ch/FS Set	io. S.			Digital Comm. Established	- Established		The Classification:		Revision	Date: 3/26/84
				!	LRF/GLLD Operational Shift Points Identified	perational dentified	X Variet	de (Cognitiv	( ) Procedura (Fixed, Structured) [X] Variable (Cognitive, Semi-Structured)	Analyst:	J. Hamilton
	Factors		Inouts		Process	Outputs					
Function(s)/Tasks	Affecting Performance	F	Content	Equip- ment	Actions	Content	To	Time (minsec)	Performance Standard(s)	lard(s)	Present Assessment Method
		Self (FO/ FIST	Known point altitude, if GLLD.	Binocu- lars, GLLD,	Determine and record the difference in alti-	Altitude differ- ence in meters between known			Altitude difference betwee known point and target to the nearest + 5 meters	2	Altitude difference between Evaluate if required. known point and target to Determine and compare the nearest + 5 meters
*If no obvious difference is ob- served, ignore this step.		Sgt)	Target and known point vertical angle	Map, Paper, Pencil	D # .	point and target Location of the target	Self (FO/ FIST Ch/FS Sgt), FDC	00:30	(FM, SM) Target located by shift from a known point within 30 seconds	nift within	Measure time from start to task completion. Determine accuracy of determined values

Subsystem			ė	OP Occupied				ı		of 3 Pages
	EO/EIGT Ch/EC Cat		Ted.	Digital Comm.	m. Established	Task Clas	Task Classification:	:	Revision	2 Date: 3/24/84
Section resitions)	ro/risi cii/rs se			EO/FIST Equ	EO/EIST Equip, Operational	X Vene	heral (Pixed le (Cognitiv	<ul> <li>Procedural (Fixed, Structured)</li> <li>Variable (Cognitive, Semi-Structured)</li> </ul>	Analyst:	J. Hamilton
	Factors	ctuants		Process	Outputs					
Function(s)/Tasks	Affecting Performance From	Content	Equip-	Actions	Content	Ę	Time	Performance Standard(s)	ndard(s)	Present Assessment Method
Conduct Adjust	120	يّ	Binocu-	Decide to re-	Initiate task	Self	00:00	Target detected and cor-	nd cor-	Observe performance
Pire Missions	environmen-	of observation	lars,	quest fire				rectly classified/identified	Jentified	•
	tal	(detected,	GLLD,							
	10) VISIOIIITY	classified and	ואר		_					
	2) Mouing	Observed ter-	Abovo	Dorform oc						
Com Tour to Market		get location	a conse	approprieto.						
1101-584-1011	4) Tempera-	plecification	Z 2	061-283-1002						
(FO/FIST Ch/FS	ture and/or	identity	, E	(Grid)						
(1.5%)	humidity		Dess.	061-283-1003						
5	extremes		Map.	(Polar)						
Request and Ad-	5) Weather		Plotting	061-283-1004						
just Area Fire	6) Terrain		Equip.							
	7) High		Terrain	٥						
Seme task as:	communica-		Sketch,	061-283-1953						Observe accuracy of
061-283-2003	tion load		Target	(LRF)						data.
on irregular	9) Personal		List	061-274-3973	Target location	Self	00:30	Locate target in no more	no more	Observe elapsed time
tanget	equipment			061-274-3974	and direction			than 30 secs. (SM)	~	
061-283-2205	and/or			061-274-3976						
assault fire	clothing	_		061-274-3977						
061-283-2103	10) Opera-			(CTTD)						
destruct mission	tional state Self	Knowledge of:	None	Select method	Data for selected Self	Self		Selected method is appro-	is appro-	Observe performance
		engagement		of engagement	method			priate		
TRI: 74		options, de-			adjustment					
		sired effect,			<ul> <li>trajectory</li> </ul>					
References/Notes		command			• ammunition					
	-	guidance.			• ruze					
- FM6-30		Target data			• fire volume					
	Sold	Vacantadas	None	Color mothod	Data for soloated	Solf		Selected method is source	-04000	Observe performance
Area Fire is reare		firing method	200	of firing	method	3		Driate	o Iddia	cose ve per rollingine
sentative and in-		bud command		<b>6</b>	• number of guns					
cludes initial proc-		Puidence			;					
esses common to										
other Request and										_
	_									
See last page (4										
of 4).										
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P. F. C.					OP Occupied				Page 2	2 of 3 Pages
	0 40000	92		Pede	sites: Digital Comm. Established	1. Established	Task Classification:	sification:	Revision	on 2 Date: 3/24/84
Section Positions)	ro/risi cn/rs	rs og			FO/FIST Equi	FO/FIST Equip. Operational	Proced  X  Variab	keral (Pixed, e (Cognitiva	Procedural (Pixed, Structured)  X  Variable (Cognitive, Semi-Structured) Analyst:	t. J. Hamilton
	Factors		Inouts		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	٩	Time (minsec)	Performance Standard(s)	Present Assessment Method
*This is the last process common to any Request and			Target loca- tion. Engage- ment data.	None	Select* appro- priate request for fire					<u> </u>
The remainder of this analysis is specific to Area		Self	Decision to request/adjust area fire	DMD/ FIST DMD	Enter/transmit FM-DMD/FIST (SM Task 061-	Message type and FM data trans- mitted	(FIST)** FDC, Self		Enter and transmit appropriate FM data within 90 seconds w/o procedural	observe:  FM type  Procedure
**If initiated by FO, message will be transmitted to			<ul> <li>target location,</li> <li>engagement</li> <li>command</li> <li>guidance</li> </ul>		7.53-1003)		FIST Ch/FS Sgt)		1013	pacagra •
FIST for approval. Approval is assumed here.		FDC	MTO, Shot and Splash messages	DMD/ FIST DMD	y/ s-	t .	Self (FO, FIST Ch/FS Sgt)		Respond promptly (MSG key)	Observe performance
		Jia	Shell burst in zone of ob- servation	Binocu- lars or GLLD					Binoculars Determine deviation corrections to the nearest + 10 meters. Determine range corrections to the nearest + 50 meters. GLLD Determine deviation and vertical interval to nearest mil and distance (range) to	5.2
1	 	<del>-</del> !	Subsequent	DMD/ FIST DMD	Enter and transmit subsequent adjust data (SM Task 061-273-1003)	<del></del>	FDC, Self (FO/ FIST Ch/FS Sgt)	+ 1	ends w/o procedural error	mance
1 1 1 1 1 1 1 1 1	! ! ! !		ve two process	es are re	The above two processes are repeated until burst at + 50 meters.	at + 50 meters.	1 1	1 1		
		_	_	_						

From Content	Subsystem F1ST Section Position(s)	FO/FIST Ch/FS Sgt	Sgt		Prequ	Prequisites: OP Occupied <u>Digital Comm. Established</u> <u>FO/FISTEquip. Operational</u>	. Established . Operational	Task Clas	Task Classification: 	Page 3  Task Classification:  Revision  [ ] Procedural (Fixed, Structured)  [X] Variable (Cognitive, Semi-Structured)  Analyst:	of 3 Pages 2 Date: 3/24/84 J. Hamilton
The Performance   From   Equip   Actions   Content   To   Innecession   To   Innecessio		Factors		Inputs		Process	Outputs				
Shell bursts DMD/ Observe bursts. Fire-for-effect (FIST)  - 50 meters FIST Enter and trans- data entered and FDC of target DMD/ to fire-for-effect mit corrections transmitted (FO/FIST)  - 50 meters DMD/ Press MSG key/ Message content Self (FO/FIST)  - 60 mid Splash FIST read each messages DML sage and Splash FIST read each messages DML sage and fifert on mit corrections (FO/FIST)  - 60 messages DML sage and fifert and trans- and files, and HOB. Dater- and HO	   Function(s)/Tasks	Affecting Performance	From	Content		Actions	Content	To	Time (min:sec)	Performance Standard(s)	Present Assessment Method
FDC MTO, Shot DMD/ Press MSG key/ Message content Self Respond promptly (MSG messages)    FIST read each messages				Shell bursts + 50 meters of target	DMD/ FIST DMD	Observe bursts. Enter and transmit corrections to fire-for-effect		(FIST) FDC Self (FO/ FIST Ch/FS Sgt)		Enter and transmit FFE Determine if FFE data within 30 seconds w/o appropriate. Measure procedural error time to complete sut task	Determine if FFE ) appropriate. Measure time to complete sub- task
FFE shell   Binocu-  Observe bursts   Enter and trenship   FFE		<u> </u>	DC	MTO, Shot and Splash messages	DMD/ FIST DMC	Press MSG key/ read each mes- sage	Message content	Self (FO, FIST Ch/FS Sgt)		Respond promptly (MSG key)	Observe performance
The preceding analysis, SM "ask 061-283-1011, applies in all respects to the flect is not achieved:  SM Tasks  061-283-1013 Conduct an IFFE Mission				FFE shell bursts	Binocu- lars, GLLD, DMD/	Observe bursts and effect on target. If necessary, determine				Enter and transmit FFE Measure and comp data within 30 seconds w/o values. Determine procedural error priete. Measure ti	Measure and compare values. Determine corrections if appropriate. Measure time
The preceding analysis, SM "ask 061-283-1011, applies in all respects to the following task, the first round is evaluated by the FO as a fire-for-effect, and adjustment is made only 161-283-1013. Conduct an Immediate Suppression Mission 161-283-1015. Conduct an FFE Mission					FIST	subsequent adjust and HOB. Deter- mine results effective or					and observe operator performance
The preceding analysis, SM "ask 061-283-1011, applies in all respects to the SM tasks listed below with the exception that for the following task, the first round is evaluated by the FO as a fire-for-effect, and adjustment is made only if desired effect is not achieved:  SM Tasks  061-283-1013 Conduct A Suppression Mission  061-283-1014 Conduct an Immediate Suppression Mission  061-283-1015 Conduct an FFE Mission				FFE shell burst	DMD FIST/ DMD	Observe FFE burst effect on target. Deter-EOM. Enter and transmit EOM	ЕОМ	io F		Desired effect achieved on target. EOM within 30 seconds after FFE bursts	Observe and evaluate effect on target. Measure elapsed time
The preceding analysis, SM "ask 061-283-1011, applies in all respects to the SM tasks listed below with the exception that for the following task, the first round is evaluated by the FO as a fire-for-effect, and adjustment is made only if desired effect is not achieved:  SM Tasks  061-283-1013 Conduct A Suppression Mission  061-283-1014 Conduct an Immediate Suppression Mission  061-283-1015 Conduct an FFE Mission						2	Vote(s)				
		The preceding that for the if desired eff	g analy followin	sis, SM "ask 0t ng task, the fir not achieved:	61-283-10 rst round	is evaluated by t	respects to the SA he FO as a fire-fo	d tasks li or-effect,	isted bela and adj	ow with the exception ustment is made only	
		SM Tasks									
		061-283-1013		iduet A Suppres	ssion Mis	sion					
		061-283-1014		iduct an Immed	liate Supl	pression Mission					•
	· <u>-</u>	061-283-1015		duct an FFE N	Aission						

Page 1 of 5 Pages Analyst: J. Hamilton Pete i ) Procedural (Pixed, Structured) IX) Variable (Cognitive, Semi-Structured) Task Classification: Propusites: OP Occupied & Dark
Digital Comn. Established
FO/FIST Equip. Operational FO/FIST Ch/FS Sgt Section Position(s)

	Factors		Inputs		Process	Outputs				
	Affecting			Equip-	\$ 1			Time	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	Present
Function(S)/Tasks	Performance	_	Content	ment	Actions	- 1	9	minsec	I	Assessment Method
Conduct Adjust	1a) Visibility		Indications of		Decision to re-	Initiation of task	Self	00:00	None, until task initiated	Observe performance
Fire Mission	environmen-	(FO/	possible target		quest illumination		(FO/			
-	tal	FIST,	in zone of ob-		in vicinity of		FIST,			
061-283-1021	2b) Visibility	Ch/FS	servation, e.g.,		possible target		Ch/FS			
	equipment	Sgt)				:	Set.			
FO/FIST Ch/FS	3) Moving		cle noises,	Мар		Estimate of grid	Self		) grid	Estimate target loca-
Sgt	vehicle		etc.		ses	location of pos-	(FO/			tion and compare
	4) Tempera-				or lights and	sible target	FIST,		meters of desired location	values
Request and Ad-	ture and/or				grid location		Ch/FS			
just Continuous/	humidity						Sgt			
Coordinated Illu-	extremes	Self	Decision to	/GWQ	ns-	2	(FIST)(1)		_	Evaluate type of FM
mination	5) Weather	(FO/	request illumi- FIST	FIST	_	FM data trans-	FDC,		06	selected appropriate,
_	6) Terrain	FIST,		DWD	<u>(-</u>	mitted	Self	•	seconds w/o procedural	based on type of tar-
TRI: 74	7) High	Ch/FS	mate of tar-		(SM Task 061-		(FO,		error	get and commander's
	communica-	Sgt)	get location,		273-1003) (simi-		FIST			guidance. Measure
References/Notes	tion load		and method of		lar task for		Ch/FS			time to complete sub-
	9) Personal		engagement		FIST DMD)		Sgt)			task and observe
• FM6-30 (Chapter equipment	equipment		and comman-							operator's procedure
(9	and/or	_								
. (SM) FM6-13F	clothing	FDC	DMD/FIST	DMD/	Observe lamp	Reading of MTO	Self		MSG key pressed promptly	Observe MSG key
(Page 2-23)	10) Opera-		DWD MSG	FIST	and/or hear	contents	(FO,		_	pressed promptly; MSG
)	tional state		indicator lamp	DMD	beep. Press MSG		FIST			indicator lamp and
(1)If initiated by			flashing and		key and read		Ch/FS			beep off. MSG ACK
FO, message will			ep		MTO contents		Sgt)			to FDC
be transmitted to		FDC	Т	DMD/		Reading of	Self		MSG key pressed promptly	Observe MSG key
FIST for review,			DWD MSG	FIST	and/or hear	SHOT. Knowledge				pressed promptly; MSG
approval or auto-			ģ	DMD	1SG	that round(s)	FIST			indicator lamp and
thru, depending on			flashing and			fired	Ch/FS			beep off. MSG ACK
FIST/DMD sub-			andible beep		SHOT message		Set)			to FDC
scriber table and		Sel.	Mumination		Observe illumina-	Decision on re-			None until next step	None until corrections
mode. This flow		(FO/	flare		72	quired HOB,				specified
assumes FIST		FIST				range and devia-				
approval.		Ch/FS				tion corrections				
		Sgt)			deviation correc-	in relation to				
		·			tion	desired area of				
						HILIMETICAL		İ		
		_								
-	_	_	_		_	_	-	_	_	

Page 2 of 5 Pages	Bevision Date:		Analyst: J. Hamilton
	Task Classification:	1   Procedural (Pixed, Structured)	IXI Variable (Cognitive, Semi-Structured)
OP Occupied & Dark	Propusites: Digital Comm Established	EO/FIST Fouris Occupations)	TOTAL PRINTED VINCIALISM
FIST		Section Position(s) FO/FIST Ch/FS Sgt	

Fueriorists Performance State		,				100000	3				
March   Content   Conten		Affecting		SINOU		Toress	Culputs		Time		Present
Figs   Pare burns   Determined   Print burns   Determined   Print burns   Determined   Print burns   Determined   Print burning   Print burn	Function(s)/Tasks	Performance	-1	Content	ment	Actions	Content		minsect	ard(s)	Assessment Method
FEST   Gescentron   Ch/FS   Gescentron   Ch/FS   Gescentron   Ch/FS   Gescentron   Ch/FS   Gescentron   Ch/FS   Gescentron   Ch/FS   Gescentron   Ch/FS   Gescentron   Ch/FS   Gescentron   Ch/FS   Gescentron   Ch/FS   Gescentron   Ch/FS   Gescentron   Gescentron   Ch/FS   Gescentron   Gesc			-	Flare burns		Determine appro-	Decision—HOB				None until corrections
First   Chief   Chie			(F0/	out during			corrections				specified
Chirty in ground grouper Hobe from ground within 200 lars and range core from ground lars burning from ground lars and range core from ground lars and range core from ground within 200 lars and range core from ground within greaters deviated area from and range core from ground lars and range core from ground great and range from ground great ground great ground great ground great ground great ground great ground great ground great gr			FIST	descent/or		tions UP/DOWN					
Figure not within 200 lars prists deviation and within 200 lars prists deviation and too restling too or within a rections corrections too or within 200 lars prists deviation and too or within a rections corrections too or within 200 lars prists desired area and transp corrections desired area and transp corrections and range corrections and range corrections and range corrections and range of mark and transported and the seconds who proceedural tests of the seconds and the seconds who proceed and the seconds are the seconds and the seconds and the seconds and the seconds are the seconds and the seconds and the seconds are the seconds and the seconds and the seconds are the seconds and the seconds are the seconds and the seconds are the seconds and the seconds are the seconds and the seconds are the seconds and the seconds are the seconds and the seconds are the seconds and the seconds are the seconds and the seconds are the seconds and the seconds are the seconds and the seconds are the seconds and the seconds are the sec			Ch/FS	flare burning		to achieve					
mithin 200 lars prise deviation deviation and markers deviation or within 200 lars and range corrections from or within 200 lars and range corrections from or within 200 large corrections (FIST) larget in zone Binocu- Decision to FIST larget in zone Binocu- Decision to FIST larget in zone Binocu- Decision to FIST larget in zone Binocu- Decision to refuse target larget		je Se	Flare not	Binocu-						None until corrections	
to or within a freetions for within a feeting from to within the feeting from to within a feeting from the feeting from the feeting from the feeting from the feeting from the feeting from the feeting from the feeting from the feeting from the feeting from from from from from from from from				within 200	lars	priate deviation	deviation and				specified
tion or within  described area  Self Determined DMD/ Enter and trans-Subsequent adjust (FIST)(2)  FIST				meters devia-			range corrections				
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FIST Ch/FS adjust data (SM transmitted Ch/FS Ch/	(2)Note: Subse-		(F)	Corrections	FIST (	_		FDC			and compare values.
Ch/FS  Set1  Target in zone Binocu Decision to FIST  Ch/FS	Onent edinetment		FIGT	COLLECTIONS	I M		_	, <u>.</u>			Measure time to com-
Fig. 1003) (similar fish for Fig. 1004)  Self Target in zone Binocu- Decision to re- Decision to repeated to great artillery locate target first detected of LLD fire to attack  Ch/FS classified, and w/TAS- target  Sgt) identified Approximate SM Task and direction Map, Perform approximate SM Task and direction Seconds  Com- Gi-283-1002 pass, Locate target Plotting by grid coord) Equip.  Binocu- Gi-283-1003 pass, Locate target Terrain by polar plot)  Sketch, or Binocu- Decision to re- Decision to classified and identified and identified and within 30 seconds  Com- Gi-283-1002 pass, Locate target transpired by grid coord) or Binocu- Gi-283-1003 polar plot)  Sketch, or Binocu- Decision to re- Decision to classified and identified and identified and within 30 seconds  Com- Gi-283-1002 pass, Locate target transpired by grid coord) or Binocu- Gi-283-1004 polar plot)  Sketch, or Binocu- Decision to re- Decision to classified and identified and i	propoduros ro-		Ch/FC					(FO)			Diete subtask and
Self Target in zone Binceu- Decision to FIST Set)  Self Target in zone Binceu- Decision to FIST Set)  Self Target in zone Binceu- Decision to Glassified and identified and w/TAS- target  Ch/FS classified, and w/TAS- target  Set) identified Map, Perform appro- Target location Map, Perform appro- Target location Map, Decision to Glassified, and w/TAS- target  Set) identified Map, Perform appro- Target location Glassified and identified A map, Perform appro- Target location Glassified, and w/TAS- target  Set) identified Map, Perform appro- Target location Glassified and identified A map, Perform appro- Target location Glassified and identified Glassified, and w/TAS- target  Set Decision to Classified and identified and identified A map, Perform appro- Target location Glassified and identified Glassified and identified Glassified and identified Glassified and identified Glassified and w/TAS- target location Glassified and identified Glassified	Deated intil de-		<b>1</b>			1003) (similar		FIST			observe operator's
Self Target in zone Binocu Decision to re- Decision to Sgt)  (FO/ of observation lars/ quest artillery locate target FIST detected.  Ch/FS classified, and w/TAS- target Sgt) identified Map, Perform appro- Target location  Map, Perform appro- Target location  Com- 061-283-1003  Binocu- 061-283-1003  Binocu- 061-283-1003  Binocu- 061-283-1003  Binocu- 061-283-1004  Sketch, or Sketch, correct target  Com- 1 Target Sy polar plot)  Sketch, correct target  Map, Perform appro- Target location  Sketch, correctly polar plot)  Sketch, correctly larget  Known point)	sired HOB and		; 8			task for FIST		Ch/FS			performance
Target in zone Binocu- Decision to reduce the content of observation lary, quest artillery locate target detected correctly quest artillery locate target detected, and w/TAS- target location decisified, and w/TAS- target location decisified, and w/TAS- target location decisified, and w/TAS- target location decisified, and w/TAS- target location decisified, and w/TAS- target location decisified, and w/TAS- target located within 30 m/2 prists SM Task and direction of 1-283-1002 pass. (Locate target located within 30 lars, locate located within 30 larget located within 30 larget located within 30 larget located within 30 larget located within 30 larget located within 30 larget located within 30 larget located within 30 larget located within 30 larget located within 30 larget located within 30 larget located within 30 larget located within 30 larget located within 30 larget located within 30 larget located larget l	area illuminated.							Sgt)		T	
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classified, and w/TAS- target identified    Map, Perform appro- Target location    M2 priate SM Task and direction    Com- 061-283-1002    Binocu- 061-283-1003    Binocu- 061-283-1003    Binocu- 061-283-1004    Com- 1st (Shift from to ont)			(FO/				locate target			classified and identified	
identified Map, Perform appro- Target location 00:30 Target located within 30 priate SM Task and direction 00:30 Target located within 30 seconds  Com- 061-283-1002 seconds  Locate target Ploting by grid coord) or Binocu- 061-283-1003 seconds  Com- 061-283-1003 seconds  Com- 061-283-1003 seconds  Locate target arget locate target or Coate target locate target locate target lars, coate target lars, coate target locate target locate target larget larget locate target locate target locate target larget locate target locate target larget locate target locate target locate target locate target larget locate larget locate larget locate larget locate target locate larget locate larget locate larget larget locate larget locate larget locate larget locate larget larget locate larget l			FIST			life to attack					
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priate SM Task and direction seconds  061-283-1002 (Locate target  1. 061-283-1003 (Locate target In by polar plot)  1. 061-283-1004 (Shift from known point)			<u>,</u>		Map.	Τ	Target location		00:30	Γ	Measure time from
061-283-1002 (Locate target ng by grid coord) 061-283-1003 (Locate target in by polar plot) of. 061-283-1004 (Shift from known point)					M2		and direction				start to completion
(Locate target  by grid coord)  of 1-283-1003  (Locate target in by polar plot)  of 061-283-1004  (Shift from known point)					Com-			•			of this subtask for
ing by grid coord)  or					Dass.	(Locate target					selected SM; determine
u- 061-283-1003 (Locate target iin by polar plot) h, or the form known point)					Plotting	by grid coord)					accuracy of determined
uu- 061-283-1003 (Locate target in by polar plot) h, or t					Fourier.	20			-		values
E 4 %					Binocu-	061-283-1003	-		-		
	_				PIS	(Locate target		_			
					Terrain	by polar plot)			_		
	-				Sketch	Cond in the Co			-		
<del></del>					Target	061-283-1004					
<del>-   </del>					List	(Shift from					
						known point)					
					1	KIIOWII DOIIIL)					
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						= -					
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Prequisites: OP Occupied & Dark
Digital Comm. Established
FO/FIST Equip. Operational Section Position(s) FO/FIST Ch/FS Sgt

Thisk Classification: [ ] Procedural (Pixed, Structured) [X] Variable (Cognitive, Semi-Stru

J. Hamilton

Self Decision to DMD/ Enter and trans- Message (FO) request and FIST mit FM data FIST mit end coordinated illumination, target and analyst area (SM Task 061- 273-1003) (siminocation, and method of engagement and commander's guidance (Iashing and audible beep DMD/FIST DMD/ Observe lamp Reading DMD MSG FIST and/or hear indicator lamp DMD/ Observe lamp Reading DMD MSG FIST and/or hear (Iashing and audible beep DMD/ Observe lamp Reading DMD/ DMD/FIST DMD/ Observe lamp Reading DMD/ DMD/FIST and/or hear Knowled Indicator lamp DMD/ Observe lamp Reading BMD/ DMD/FIST and/or hear Knowled Indicator lamp DMD/ Observe lamp Reading Audible beep SHOT message (FO/ Zone of ob- lars) tion from bursts. Subseque (FO/ Zone of ob- lars) tion from bursts. Subseque (FN/FS) servation to target target		Factors		Inouts		Process	Outputs					
Fig.   Decision to   DMD/   Enter and trans- Message type and   (FSTM)   Enter and transmit appropriate PM data trans-   FIST   digital stread   FIST   milt PM data   FIN   FIST   digital stread   FIST   digital stread   Ch/FS   file and coor   DMD/   FIST   milt PM data   FIST   milt PM data   FIST   milt PM data within 30   FIST   milt pM data within 30   FIST   milt pM data within 30   FIST   milt pM data within 30   FIST   milt pM data   FIST   milt pM data   FIST   milt pM data   FIST   milt pM data   FIST   milt pM data   FIST   milt pM data   FIST   milt pM data   FIST   milt pM data   FIST   milt pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   FIST   miltident pM data   mil	sks	Affecting Performance		Content		Actions	Content		Time	Performance Standard(s)	Present Assessment Method	
FIST adjust area billion become and conformed and conforme		AND THE PARTY OF T	ш.	Decision to	DMD/	_	Message type and	(FIST)(1)		Enter and transmit appro-	Evaluate type of FM	_
First Street and coordinate and coordinated library			(FO/	request and	FIST	_	FM data trans-	FDC.		priate FM data within 90	selected appropriate,	
Ch/FS fire and coordinated allowing the method of engline and coordinated and confined and commanders and comma			FIST	adjust area	DMD	_		Self		seconds w/o procedural	based on type of tar-	_
Mace of the control o			Ch/FS	fire and coor-		(SM Task 061-		(FO,		error	get and commander's	
nettod of en- gagement and commander's guidance Guidance FDC DMD/FIST DMD/ DMD MSG FIST and/or hear Conferts FDC DMJ/FIST DMD/ Indicator lamp DMD beep. Press MSG Guidance rand MTO contents FDC DMJ/FIST and/or hear Conferts FDC DMJ/FIST and/or hear Conferts FDC DMJ/FIST and/or hear Conferts FDC DMJ/FIST and/or hear Conferts FDC DMJ/FIST and/or hear CDMJ/FIST DMD/ FDC DMJ/FIST DMD/ CDMJ/FIST DMD/ FDC DMJ/FIST and/or hear FDC DMJ/FIST DMD/ FDC DMJ/FIST and/or hear FDC DMJ/FIST DMD/ FDC DMJ/FIST DMD/ FDC DMJ/FIST DMD/ FDC DMJ/FIST DMD/ FDC DMJ/FIST DMD/ FDC DMJ/FIST DMD/ FDC DMJ/FIST DMD/ FDC DMJ/FIST DMD/ FDC DMJ/FIST DMD/ FDC DMJ/FIST DMD/ FDC DMJ/FIST DMD/ FDC DMJ/FIST DMD/ FDC DMJ/FIST DMD/ FDC DMJ/FIST DMD/ FIST and/or hear FDC DMJ/FIST DMD/ FIST Grand and and read FDC DMJ/FIST DMD/ FIST Grand and and read FIST And/or hear FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and and read FIST Grand and read FIST Grand and and and and and and and and and			Sg t.)	dinated illumi-		273-1003) (simi-		FIST			guidance. Measure time	
method of engagement and gagement and guidance and mander's guidance and gagement and guidance a				nation, target		lar task for FIST		Ch/FS			to complete subtask	
gegement and commander's guidance  FDC DMD/FIST FIST and/or hear indicator lamp DMD MSG FIST and/or hear indicator lamp DMD MSG FIST and/or hear indicator lamp DMD MSG FIST and/or hear Knowledge that (FO, DMD/FIST DMD) Observe lamp Reading of SHOT. Self Ch/FS and/or hear Knowledge that (FO, Indicator lamp DMD MSG FIST and/or hear Knowledge that (FST and/or hear Knowledge that (FST and/or hear Knowledge that (FST and/or hear Knowledge that (FST and/or hear Knowledge that (FST and/or hear Knowledge that (FST and/or hear Knowledge that (FST and/or hear SPLASH message (FO, Indicator lamp DMD MSG FIST and/or hear Knowledge that FIST and/or hear SPLASH message (FO, Indicator lamp DMD MSG FIST and/or hear Knowledge that FIST (FO) Self Shell burst in Binocu Observe bursts. Subsequent corrections to move (FO/FS Servation Ch/FS Servation to the Ch/FS Servation to the Ch/FS Servation to the Ch/FS target target target.				location, and		DMD)		Set)			and observe operator's	
gagement and commander's commander's commander's commander's guidance commander's FIST DMD/ Observe lamp Reading of MTO Self (FIST Inshing and and/or hear MTO contents MND/FIST DMD/ Observe lamp PROF DMD/FIST DMD/ Observe lamp Reading of SHOT. Self Chashing and Charles DMD/FIST DMD/ Observe lamp Reading of SHOT. Self DMD/FIST DMD/ Observe lamp Reading of SHOT. Self Chashing and Charles DMD/ Observe lamp Reading of SHOT Charles DMD/FIST and/or hear SPLASH message (Ch/FS Indicator lamp DMD MSG key and read Self Mashing and MSG key and rounds will burst Ch/FS read SPLASH within 5 seconds message (3)  Self Shell burst in Binocu- Observe lamp Reading of SHOT. Self Ch/FS cone of oblashing and message (3)  FIST servation (FO/ Zone of ob- lars tion from bursts subsequent ad- FIST (Ch/FS Set)  Ch/FS servation to anget target to the Set)				method of en-				· •			procedure	
Ecommander's  guidance  FDC DMD/FIST DMD/ Observe lamp Reading of MTO Self Indicator lamp DMD MSG REST Auchible beep DMD/FIST DMD				generation and								
FDC DMD/FIST DMD/ Observe lamp Reading of MTO Self DMD/FIST and/or hear audible beep audible beep Contents DMD MSG FIST and/or hear Brown Round(s) fired Ch/FS audible beep Contents DMD/FIST DMD/ Observe lamp Reading of SHOT. Self Inshing and audible beep Contents DMD/FIST DMD/ Observe lamp Contents Ch/FS Self Shell burst in Binocu- Observe bursts. Subsequent corfers Self Shell burst in Binocu- Observe bursts. Subsequent corfers Self Shell burst in Binocu- Observe bursts. Subsequent corfers Self Shell burst in Binocu- Observe bursts. Subsequent and FIST Ch/FS Self Shell burst in Binocu- Observe bursts. Subsequent corfers Self Shell burst in Binocu- Observe bursts. Subsequent and FIST Ch/FS Self Shell burst in Binocu- Observe bursts. Subsequent and FIST Ch/FS Self Shell burst in Binocu- Observe bursts. Subsequent and FIST Ch/FS Self Shell burst in Binocu- Observe bursts. Subsequent and FIST Ch/FS Self Shell burst in Binocu- Observe bursts. Subsequent and FIST Ch/FS Self Shell burst in Binocu- Observe bursts. Subsequent and FIST Ch/FS Self Shell burst in Binocu- Observe bursts. Subsequent and FIST Ch/FS Self Shell burst in Binocu- Observe bursts. Subsequent and FIST Ch/FS Self Shell burst in Binocu- Observe bursts. Subsequent and FIST Ch/FS Self Shell burst in Binocu- Observe bursts. Subsequent and FIST ch/FS Self Shell burst in Binocu- Observe bursts. Subsequent to the Self Shell burst in Binocu- Observe bursts. Subsequent to the Self Shell burst in to target to any self shell burst in the character burst subsequent and FIST ch/FS Self Shell burst in the character burst subsequent and Self Shell burst in the character burst subsequent to the Ch/FS Self Shell burst in the character burst subsequent to the Ch/FS Self Shell burst in the character burst subsequent to the Ch/FS Self Shell burst in the character burst subsequent to the Ch/FS Self Shell burst in the character burst subsequent self-burst subsequent self-burst subsequent self-burst subsequent self-burst subsequent self-burst subsequent self-burst subseque				gagement and								
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indicator lamp DMD MSG findshing and audible beep DMD/ Observe lamp DMD MSG findshing and audible beep BMD/ Observe lamp BRading of SHOT. Self and/or hear Rowledge that (FO, indicator lamp DMD MSG find audible beep SHST and/or hear SPLASH message, BMD MSG FIST and/or hear SPLASH message, GN/FS indicator lamp DMD MSG key and read audible beep BMD/ Observe lamp Reading of Self BMD/ Observe lamp Reading of Self Indicator lamp DMD MSG key and rounds will burst Ch/FS and/or hear SPLASH message, GN/FS and/or hear SPLASH message, GN/FS and/or hear Self Indicator lamp DMD MSG key and rounds will burst Ch/FS and/or hear Self Shell burst in Binocu- Observe bursts. Subsequent cor-Self Ch/FS servation to the Ch/FS target to target target.		_	FDC	DMD/FIST	DMD/			Self		MSG key pressed promptly	Observe MSG key	
indicator lamp DMD beep. Press MSG  audible beep  BMD/FIST  DMD/FIST  DMD MSG  FIST  DMD MSG  FIST  DMD MSG  FIST  DMD/FIST  DMD MSG  FIST  BMD/ Observe lamp  Bashing and BMD  Chriss MSG  Acquarity beep. Press MSG  BMD MSG  FIST  DMD/FIST  DMD/FIST  DMD/FIST  DMD/FIST  DMD/ Observe lamp  BMD MSG  FIST  BMD/ Observe lamp  BMD MSG  FIST  And/or hear  SPLASH message. (FO, indicator lamp DMD beep. Press  MSG key and rounds will burst Chriss  audible beep  audible beep  BMSG FIST  And/or hear  SPLASH message. (FO, indicator lamp DMD beep. Press  MSG key and rounds will burst Chriss  Amessage(3)  Self  Shell burst in Binocu- Observe bursts. Subsequent corform to the Chriss  Chriss  Sett)  Sett)  Sett  Chriss  Amessage conds  Amessage (1)  Amessage (1)  Sett)  Sett  Sett)  Sett  Chriss  Sett  Chriss  Sett)  Sett  Chriss  Amessage (1)  Am				DMD MSG	FIST			(FO,			pressed promptly; MSG	
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HDC DMD/FIST DMD/ Observe lamp Reading of SHOT. Self DMD MSG FIST and/or hear Knowledge that (FO, indicator lamp DMD Dwep. Press MSG round(s) fired FIST and/or hear SPLASH message Self DMD/FIST and/or hear SPLASH message (FO, indicator lamp DMD Dwep. Press Knowledge that FIST flashing and audible beep read SPLASH message (FO, indicator lamp DMD MSG key and rounds will burst Ch/FS audible beep read SPLASH within 5 seconds message(3)  Self Shell burst in Binocu- Observe law, instruct to the Ch/FS (FO/Sone of ob-lars Measure devia- rections to move (FO/FS) (FIST servation to the Ch/FS)  Sgt)				fleshing and	1	poor puo non		) H/ES			heer off MSG ACK	
Audible beep MIO contents  BDMD MSG  BMDD MSG  BMDD MSG  Indicator lamp DMD beep. Press MSG round(s) fired FIST  Audible beep And read SPLASH message  BDMD MSG  Indicator lamp DMD beep. Press MSG round(s) fired FIST  BMD MSG  Indicator lamp DMD beep. Press Knowledge that FIST  Indicator lamp DMD beep. Press Knowledge that FIST  Inashing and MSG key and rounds will burst Ch/FS  Self Shell burst in Binocu- Observe bursts. Subsequent cor- Self  (FO/ zone of ob- lars Measure devia- rections to move (FO/ FIST servation to the Ch/FS  Sgt)  Sgt)				I LESTING BING		Key and read		2 (2)			occip on: mod non	
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indicator lamp DMD beep. Press MSG round(s) fired fired flashing and audible beep beep. Press flashing and from burst in Self Shell burst in Binocu-Observe bursts. Subsequent corfers flow from bursts servation to the following flashing and flashing and flashing and servation from bursts subsequent adfall burst in Binocu-Observe bursts. Subsequent adfall burst in Binocu-Observe bursts subsequent adfall burst in Binocu-Observe bursts subsequent adfall burst in Binocu-Observe bursts subsequent adfall burst in Binocu-Observe bursts subsequent adfall burst in Binocu-Observe bursts subsequent adfall burst in Binocu-Observe bursts subsequent adfall burst burst in Binocu-Observe bursts subsequent adfall burst burst in Binocu-Observe bursts subsequent adfall burst bu			FDC	DMD/FIST	DMD/		_	Self		MSG key pressed promptly	Observe MSG key	
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flashing and audible beep SHOT message Sgt)  FDC DMD/FIST DMD/ Observe lamp SPLASH message, (FO, indicator lamp DMD beep. Press Knowledge that fiST flashing and audible beep message (3)  Self Shell burst in Binocu- Observe bursts. Subsequent cor- Sclf (FO/ Zone of ob- lars Masaure devia- rections to move (FO/ FIST servation to target to target Sgt)				indicator Jamo	OMO		round(s) fired	FIST			indicator lamp and	
EDC DMD/FIST DMD/ Observe lamp Reading of Set)  EDC DMD/FIST and/or hear SPLASH message, (FO, indicator lamp DMD beep. Press Knowledge that FIST audible beep read SPLASH message, (FO, audible beep read SPLASH within 5 seconds message(3)  Self Shell burst in Binocu- Observe bursts. Subsequent corferon to move (FO/FIST servation to target to target target.				Doching and	2			04/EC			heer off MSG ACK	
FDC DMD/FIST DMD/ Observe lamp Reading of Self DMD MSG FIST and/or hear SPLASH message, (FO, indicator lamp DMD MSG key and rounds will burst Ch/FS audible beep read SPLASH within 5 seconds message (3) Self Shell burst in Binocu- Observe bursts. Subsequent corfeto/ zone of oblass Measure deviares the cettions to move (FO/FS) FIST servation to target justment to the Ch/FS Sgt) Sgt)  FDC DMD/FIST Self FIST and/or hear SPLASH message, (FO/FS) FIST servation to target justment to the Ch/FS Sgt)				DIR SIIIII		key and read		CIVES			to pro	
FDC DMD/FIST DMD/ Observe lamp Reading of Self and/or hear SPLASH message, (FO, indicator lamp DMD Deep. Press Knowledge that FIST flashing and MSG RAy and rounds will burst Ch/FS audible beep read SPLASH within 5 seconds message(3)  Self Shell burst in Binocu- Observe bursts. Subsequent corfet/FS servation to the Ch/FS servation to target to the Ch/FS Sgt)  Sgt)  FDC DMD/FIST and/or hear SPLASH message, (FO, FIST Ch/FS Sgt)  Long DMD MSG FIST Ch/FS seconds message(3)  Lead SPLASH message, (FO, FIST Ch/FS Seconds message(3)  Lead SPLASH message, (FO, FIST Ch/FS Seconds message(3)  Lead SPLASH message, (FO, FIST Ch/FS Seconds message(3)  Lead SPLASH message, (FO, FIST Ch/FS Seconds message(3)  Lead SPLASH message, (FO, FIST Ch/FS Seconds message(3)  Lead SPLASH message, (FO, FIST Ch/FS Seconds message(3)  Lead SPLASH message, (FO, FIST Ch/FS Seconds message(3)  Lead SPLASH message, (FO, FIST Ch/FS Seconds message(3)  Lead SPLASH message, (FO, FIST Ch/FS Seconds message(3)  Lead SPLASH within 5 seconds message(3)  Lead SPLASH within 5 seconds message(3)  Lead SPLASH within 5 seconds message(3)  Lead SPLASH within 5 seconds message(3)  Lead SPLASH within 5 seconds message(3)  Lead SPLASH within 5 seconds message(3)  Lead SPLASH within 5 seconds message(3)  Lead SPLASH within 5 seconds message(3)  Lead SPLASH within 5 seconds message(3)  Lead SPLASH within 5 seconds message(3)  Lead SPLASH within 5 seconds message(3)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds message(4)  Lead SPLASH within 5 seconds messa			1	audibie beep		7		128			io riv	_
indicator lamp DMD MSG FIST and/or hear SPLASH message, (FO, indicator lamp DMD beep. Press Knowledge that FIST MSH within 5 seconds audible beep read SPLASH within 5 seconds message(3)  Self Shell burst in Binocu- Observe bursts. Subsequent cor- Self (FO/ zone of ob- lars Measure devia- rections to move (FO/ EIST servation to the ch/FS servation to the ch/FS servation to target target Sgt)				DMD/FIST	DMD/			Self		MSG key pressed promptly	Observe MSG key	
flashing and MSG key and rounds will burst Ch/FS audible beep read SPLASH within 5 seconds message(3)  Self Shell burst in Binocu-Observe bursts. Subsequent cor-FIST servation to the Ch/FS Sgt)  Sgt)  Indicator lamp DMD beep. Press Knowledge that FIST read SPLASH within 5 seconds message(3)  Self Shell burst in Binocu-Observe bursts. Subsequent cor-FIST tion from bursts subsequent ad-FIST to target to the Ch/FS Sgt)	essage			DWD WSG				(FO,			pressed promptly; MSG	
flashing and audible beep read SPLASH within 5 seconds message 3)  Self Shell burst in Binocu- Observe bursts. Subsequent corferor of oblassing and tion from bursts subsequent adgret to the Ch/FS Sgt)  Sgt)  Graff Ch/FS  Sgt)  Graff Ch/FS  Sgt)  Graff Ch/FS  Sgt)	ion of			indicator Jampi		Press	Knowledge that	FIST			indicator lamp and	
audible beep read SPLASH within 5 seconds message(3)  Self Shell burst in Binocu- Observe bursts. Subsequent cor- Self (FO/ zone of ob- lars Measure devia- rections to move (FO/ EL/FS servation to target to target Sgt)  Sgt)  Lot target arget Sgt)	This			flashing and		pue ve	rounds will burst	Ch/FS	•			
Self Shell burst in Binocu- Observe bursts. Subsequent cor- Self (FO) zone of ob- lars Massure devia- rections to move (FO) FIST Ch/FS to target to target target Sgt)	2		_	Ministrial Control			Cincipal Will College					
Self Shell burst in Binocu- Observe bursts. Subsequent cor- Self (FO) zone of ob- lars Massure devia- rections to move (FO) FIST servation to target to target target Sgt)	3			gangione peep			within 5 seconds					
Servation to target busts. Subsequent con move (FO/ servation to target justment to the Ch/FS target sgt)	;		2100	Sholl bunct in	Bigger	Τ,	Subsection + con-	Colf		Determine deviation correct	Messure deviations and	
servation tion from bursts subsequent ad- FIST meters. Determine range to target justment to the CMFS corrections to the nearest target Sgt) + 50 meters			,	ance of the	10.00	_		(23)		tions to the possess + 10	order order	
Servation ton from bursts subsequent ad- rist to target justment to the Ch/FS target (arget Sgt)			) i	2010 01 00	SIBI		<u>.                                    </u>			tions to the nearest 10	compare variacs	
to target justment to the Ch/FS target Sgt)			1517	servation		<u>.</u>	snosednenr ad-	121		meters. Determine range		
target Sgt)			Ch/FS				justment to the	Ch/FS		corrections to the nearest		
			Set				target	Set)		+ 50 meters		
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••	Septem 1115				Pred	Maite: Or Occupied	Digital Comm. Established	Task Classification:	ification:	Bevision	Dete
•	Section Position(s) <u>FO/</u>	FO/FIST Ch/FS Set	38			FO/FIST Equ	FO/FIST Equip. Operational	Proced  X  Variable	ural (Fixed • (Cognitiv	Procedural (Pisad, Structured)     Analyst:	Analyst: J. Hamilton
_		Factors		Inouts		Process	Outputs				
	Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	To	Time Ininsec	Performance Standard(s)	Present Assessment Method
			Self Self	Subsequent	/QWQ	Enter and trans-	Subsequent adjust	(FIST)(2)		Enter and transmit subse-	Measure time to com-
			(FO/	corrections	FIST	mit subsequent	data entered and			quent adjust data within	
			FIST		DMD	adjust data (SM	transmitted	Self		TBD seconds w/o procedural	_
			Ch/FS			Task 061-273-		(FO/		error	performance
			(1) (2)			1003) (Similar		7 151 Ch/FG			
						DMD		Sgt)			
				Shell bursts	/QWQ	Observe bursts.	Fire-for-effect	(FIST)(1)		Enter fire-for-effect within Determine FFE appro-	Determine FFE appro-
				± 50 meters	FIST	Enter and trans-	data entered and	FDC,		+ 50 meters of target.	priately. Measure time
_				of target	DMD	mit corrections	transmitted	Self		Enter and transmit FFE	to complete subtask
.24						to fire-for-effect.		) i		data within TBU seconds	and observe operator's
						If time desired,		1217	-	W/o procedural error	periormance
						request ruze time		Set) FS			
			FDC	Shell bursts	DMD/	rve lamp	E			Enter fire-for-effect within Observe MSG key	Observe MSG key
			_	± 50 meters	FIST	and/or hear				+ 50 meters of target.	pressed promptly; MSG
			_	of target	OWO.	32	round(s) lired	3 6		Lenter and transmit FFE	indicator lamp and
						Key and read		FIST		w/o procedural error	to FDC
-						19 mm		Ch/FS			
	-							Sgt)			
			FDC	Shell bursts	DMD/	Observe lamp	Reading of	(FIST)(1)		Enter fire-for-effect within Observe MSG key	Observe MSG key
				+ 50 meters	FIST	and/or hear	SPLASH message.	FDC,		+ 50 meters of target.	pressed promptly; MSC
				of target	OWO.	beep. Press MSG		, Kell		Enter and transmit FFE	Indicator lamp and
						Spi ASH mos-	within 5 seconds	100		w/o procedural error	to FDC
						sage		Ch/FS			
								(£			
					-						
			· <b>-</b>			_					
									•		

Proquisites: OP Occupied & Dark

Section Praisions,	FO/FIST Ch/FS Set	198.		<u> </u>	Digital Com	Digital Comm. Established	Thek Cless	Thek Classification:	Revision	Date:
					יים וצוב/חב	ruzelo equip. Operational	X Variab	• (Complete	[X] Variable (Cognitive, Semi-Structured) Analyst:	J. Hamilton
	Factors		Inouts		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	To	Time (minsec)	Performance Standard(s)	Present Assessment Method
		Self (FO/	FFE shell bursts	Binocu- lars	Observe bursts and effect on terrest of the person of the	Enter and trans- mit corrections			Enter and fire-for-effect corrections. Transmit FFE data within TRD seconds	Measure and compare values. Determine corrections appropriate.
		Ch/FS Set)		DMD/ FIST	sary, sketch using subsequent				w/o procedural error after bursts	Measure time and observe operator's
		•		DMD	adjust (to in- clude HOB cor- rections, if de-					performance
					results effective					
					Observe FFE	Decision to EOM			Desired effect achieved on Observe and evaluate target	Observe and evaluate effect on target
					target. Deter- mine end of				<b>.</b>	)
		J[8S]	Decision to	/QWQ	mission (EOM) Enter and trans-	EOM results	(FIST)		EOM (w/refinement data)	Measure time and
		(FO/	ЕОМ	FIST	mit EOM and		FDC,		transmitted within TBD	observe operator's
		FIST Ch/FS		DMD	results. (Enter only final refine-		Fo's		seconds after FFE bursts w/o procedural error	performance
		Sgt)			ment data [de- viation, vertica]		FIST Ch/FS			
					interval and		Sgt)			
					range! if neces- sary)					
							-			
							-			
								-		

PICT					OP Occupied				- -		of 2 Pages
2	9.1			Prequ	Prequisites: Digital Comm. Established	n. Established	Task Clas	Task Classification:		Revision	Date: 3/19/84
Section Positions)	2				AN/GVS-5 Prepared for Operation	epared for	XI Proce	heral (Pixed to (Cognitiv	[X] Procedural (Fixed, Structured) [ ] Variable (Cognilive, Bemi-Structured) A	Amalyst:	J. Hamilton
	Factors		Inputs		Process	Outputs					
Function(s)/Tasks	Affecting Performance 1	From	Content	Equip-	Actions	Content	Ę	Time (minsec)	Performance Standard(s)	ard(s)	Present Assessment Method
Conduct Adjust	94.7		Target in AN/	AN/ GVS-5	rget	Initiation of task Self	Self (FO)	00:00	Task is initiated promptly	mptly	Observe performance
	tal  (a) Visibility		vation	2	tance to target						
	equipment			AN/	Remove laser	LRF lens cover	Self		L.R.F. lens cover removed	oved	Observe time to
	2a) Noise environmen-	•		GVS-5	range finder rem (LRF) lens cover ON	removed, POWER ON	(FO)		and POWER ON accom- plished without delay	-mo: v	POWER ON
	tal 2b) Noise	-			Set PWR to ON						
SM Task # & Name				AN/	Hold the LRF	Target aligned in	Self		Target aligned promptly	ptly	Observe performance
1061-283-1952 (FD)	5) Weather			ر-د. د-د	steady (standing, center circle of supported or ILRF reticle	center circle of	)		center circle of the LRF	LRF	
) :	7) High				prone position)				reticle		
Operate the Laser	communica-				sight through						
Kange Finder	tion load 9) Personal				the eyepiece and						
	equipment				circle of the						
TRI: 65	and/or				reticle pattern						
Doforconos/Notes	clothing				on the desired						
Meleticines/ Motes	tional state			AN/	Observe target	Distance to tar-	Self		Distance to target accu-	accu-	Measure the distance
• FM6-30 (Pg. 6-				GVS-5	properly aligned		(FO)		rate to within + 10 meters	meters	from the FO location
(SM) FM6-13F				-		Distance no longer displayed			(F.19)		pare readings
					target in meters						
					in the range-to-						
*If "multiple tar-		·			target window						
observed in eye-					Set the PWR						
piece, it indicates					switch to OFF		,				301
that more than				AN/	Compare the	Determination	æ 6		Correct determination that	on that	Compare LNF range
one return signal				GVS-5	displayed range	that range to	<u>.</u>		range to target is accu-	-naai	to map-terram analysis range
was received.				Terrot	torrain analysis	rate/not accurate			ומוכ/ווסו מככוו מנכ		•
				Area	and estimate of	נמוב/וומר מכבחומוב					
					range to target						
			-								

PO) ANALYSIS
T-PROCESS OUTPUT (IPO)
M ENGAGE INPUT-PROCESS-O
GUNNERY TEA

Subsystem FIST				Precord	Premisite: OP Occupied		1	That Characters	E	!	5
Section Positionis)	FO				Digital Comm. Establish	Digital Comm. Established	X Proper	deret (Pire		Revision	Date: 3/19/84
					Operation	To lease to	) Varieb	de (Cognultiv	I j Variable (Cognitive, Semi-Structured) A	Analyst: J	J. Hamilton
	Factors		Inputs		Process	Outputs					
Function(s)/Tasks		From	Content	Equip- ment	Actions	Content	To	Time (minsec)	Performance Standard(s)	rd(s)	Present Assessment Method
	·			AN/ GVS-5	LRF range to target, make additional LRF range determinations until three consistent readings obtained by repeating above LRF PWR ON and lasing procedures	rar de t	Self (FO)		Three consistent LRF range-to-target determina- tions accurate to ± 10 meters with minimum delay		Observe time to complete 3 determinations. Compare lased range to actual

S. thereases	-				Pointing O				•	-	of 3 Pages
	Ç			The La	Prequisites: M2 Compass Declinated	Declinated	Task Class	Task Classification:		Revision	Date: 3/20/84
Section Position(s)	D.		:		Digital Comm	Digital Comm. Established IX Procedural (Fixed, Structured)	X Proced	dural (Fixed, de (Comitiv		Anelyst:	J. Hamilton
					AN/GVS-5 PC	ep o tor Operations					
_	Factors		Inputs	- 1	Process	Outputs		i			
Function(s)/Tasks	Affecting Performance	 From	Content	Equip- ment	Actions	Content	To	Time (minsec)	Performance Standard(s)		Assessment Method
Locate Targets	1a) Visibility Self	Self	Two known	AN/	Need to deter-	ftask	Self	00:00	Task initiated promptly		Observe performance
	environmen-	(FO)	terrain fea-	GVS-5	mine observer		(FO)				
	tal		tures that can		location with the						
	1b) Visibility		be lased w/		aid of AN/GVS-5						-
	equipment		LRF from OP		Laser Ranger						
SM Task # & Name 5) Weather	e 5) Weather				Finder (LRF)	T					
061-283-1959	6) Terrain			\ \ \ \ \ \	Measure the dis-Distance in me-	Distance in me-	Self	-	Distance to each of the	e e	Measure the distance
(FO)	9) Personal			GVS-5,	ž	ters to two	(FO)		known points accurate to		from the FO location
	equipment			Paper,	the two known	known points from			within + 10 meters (FM)		to each of the known
Determine Location and/or	nand/or			Pencil	points by per-	FO location					points and compare
with the Laser	clothing				forming SM 061-	recorded					the values
Range Finder (LR)   10) Opera-	10) Opera-				283-1952 (Oper-						
AN/GVS-5	tional state				ate the LRF)	14-70					
			_		and record the		_				
TRI: 65					values						
				M2	Using the com-	sils	<u>ا</u>	_	Direction to each of the	훒	Measure the direction
References/Notes				Com-	pass, measure		(FO)		known points accurate to		from the FO location
				pass	the direction	points from the			within + xx mils		to each of the known
. SM (FM6-13F)					(azimuth) to	FO location					points and compare
(Pg. 2-35)					each of the	recorded					the values
					above known						
					points and						
			,,		record the values	31-3	3150		Dealth of the to to do	1	Desform the colombition
		3 (S	Kecorded di-	7000	beak-ezimuth to	pererimined Dack- Sell	(EO)		termined to within A mile	_	and compare values
		) 	mile to known			of the known	· ·				
			noints		ij	points				_	
			3	Plotting	rections by:						
				Equip.	Subtanosting						
				dinka	3900 th if dings						
					3200 Mi II direc-			•			
					tion is between						
					3200 m and						
-					6400 m.						
					Adding 3200 m						
					יו מוופרונטו וצ						
					Detween 0 and						
					3199 M						
										-	

Date: 3/22/84 Analyst: J. Hamilton Page 2 Prequisites: OP Occupied Task Classification:

M2 Compass Declinated to Procedural (Pixed, Structured)

Digital Comm. Established to Operations I I Variable (Cognitive, Semi-Structured) FO EIST Section Position(s)

				_		_	_									_	_	_			_	_		_		_	_	_		_									_	_	_			_	_	_
	Present	_	_	points and evaluate												Plot back-azimuth and	compare							Observe line accurate	and chaoight drawn or	BIRD STRAIGHT OF BWILL BS	required				Measure distance and	compare										1 1 1 1 1 1 1 1 1	: : : : : : : : : : : : : : : : : : : :	_		
		Performance Standard(s)	Known points plotted accu-	rately. Protractor oriented	properly	640.14										Back-azimuth indicated	accurately on the map.	(Should be a light pencil	point mark.)					Tine prominete and straight	drown between brown	Grawn Detween Known	point and back-azimuth	mark			Distance to FO location	accurately measured from	known point													
	Time	(minsec)																																									peation.			
		Ą	્રકા સ્ટા	(FO)												Self.	() ( <u>)</u>							19	3 (2)	(10)					Jias	(FO)										1 2	ַב יַב ביים ביים			
Outputs		Content	Each known point	plotted. Protrac-	or oriented N-S	on known point in	DII KIIOWII POIIIC III	the direction of	the back-azimuth						Ī			map as the back	azimuth to known	point				A line drown	from known goint	Irom the plotted irom known point (ro)	through back-	azimuth mark			Distance from	known point to	FO location accu-	rately indicated									for second known point to determine FU ipeation.	1		
Process		Actions	Accurately place		each of the	Lacin of the	KINOWII POINTS.	Orient the pro-	tractor parallel	to N-S Grid	while placing the	index ones one	illuca over one	of the known	points		tractor azimuth	scale and lightly	mark the back	azimuth to the	known noint	Branch Abr	Remove the	Drow a line		Irom the plotted	known point	through the	back-azimuth	point	Accurately	measure the re-	corded distance	from the plot-	ted known point	along the back-	azimuth line and	mark where on	the line the de-	sinod distance is	measured		e ror second know			
	Equip-	ment	Plotting	Equip-	Tront.	Doneil	Lencii	Мар								Plotting	Equip-	ment,	Pencil,	Map	•			Diotting	riottiig Feriji	-dinb-	ment,	Pencil,	Мар		Plotting	Equip-	ment,	Мар,	Pencil								procedur			
Inouts		Content																													Recorded dis-	tance to	known points										Repeat above proced	1		
. !		From																													Sell	(FO)										 	 			
Factors	Affecting	Performance																																								1 1 1 1	1			
		Function(s)/Tasks												_																				_								1 1 1 1 1 1 1 1				
-			•						-							B	-3	.7						-				_									_		-							

Subaystem FIST					OP Occupied				<b>~</b>	2	Page 3 of 3 Pages
l (apple)	FO			<b>.</b>	M2 Compass Declinated	Declinated		Their Clarking (Pine)		Revision	Date: 3/22/84
					Digital Comr	Digital Comm. Established M. Procedum United, Semi-structured) AN/GVS-5. Prep'd for Operations 1 variable (Cognitive, Semi-structured)	S I I Variat	de (Cognitiv		Analyst: J	J. Hamilton
	Factors		Inouts		Process	Outputs					
Function(s)/Tasks	, e	From	Content	Equip- ment	Aetions	Content	To	Time (minsec)	Performance Standard(s)		Present Assessment Method
"The coordinates must be plotted for each of the unknown points from the two known points data (back-azimuth and distance).	<del></del>				Piot coordinates of the unknown point (FO location)*	82			The coordinates of the unknown point determined from the second known point must be within +50 meters of those determined from the first point**		Plot the points and measure the accuracy
+ 50 meters, repeat the task.											
GENERAL NOTE:	The FO can transmit cook	also mea dinates	The FO can also measure the distance and directransmit coordinates in an OBSVR LDC message.	unce and a	direction to the ki	The FO can also measure the distance and direction to the known points and transmit these data transmit coordinates in an OBSVR LDC message.	ınsmit ti	ese data	to FDC who can determine his location and	termine	his location and
· · · · · · · · · · · · · · · · · · ·				-							
	- ·			·						<del></del> ,	

Chi.

Page 1 of 3 Suppay		Mevision 2 Date: 3/24/8	Analyst: J. Hamilton	
	Task Classification:	1 December 1 (Bine) Characteristic	(X) Variable (Cognitive, Semi-Structured)	
	Proquisites: OP Occupied	Digital Comin. Established	FU/FIST COMP. Operational	
	Subsystem FIST	Section Position(c) FO/FIST Ch/FS Sort		

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	Present	Assessment Method	Observe performance														Observe accuracy of	dete.	Observe eleneed time	Conterna englace cultic					CORELAG DECLOCIMENCE							Observe performance									_
		Performance Standard(s)	Target detected and cor-	rectly classified/identified															I conto temest in no mines	then 20 core (chi)	tildii 30 secs. (SM)			1 10	Selected method is appro-	priate						Selected method is appro-	priate								
	Time	minsec	00:00																00.00																						
		To	Self																Colf						======================================							Self		<b>5</b> *			_				
Outputs		Content	Initiate task																Total lossion	rarget rocation	HOLDSHIP MIR				Data for selected sell	method	• adjustment	• trajectory	• dilliminimini	e Tuze	• fire distribution	Data for selected	method	<ul> <li>number of guns</li> </ul>	• interval						
Process		Actions	Decide to re-					Perform as	appropriate:	061-283-1002	(Grid)	061-283-1003	(Polar)	2	(Known point)	2			061-974-3073	6186-416-100	#16C-#17-TOD	0.65-674-1976	061-274-3977	(ALLU)	Select method	of engagement						Select method	of firing	•							
	Equip-	ment	Binocu-	lars,	GLLD,	LRF		Above	plus	M2	Com-	Dass.	Map.	Plotting	Forms	Tornoir	Sketch	Townson .	l int		_				None							None									
Inouts	\	Content	Target close	to maneuver	element or	company as-	signed a FPF	Observed tar-	get location.	classification.	identity	•													Knowledge of:	engagement	options, de-	Sired ellect,	Comment	guidance.	ושת לבני חשוש	Knowledge of	firing method	and command	guidance						
		From	Self					ias Seri																	<u> </u>							Self									
Factors	Affecting	Performance	1a) Visibility	environmen-	tal	1b) Visibility	equipment	3) Moving	vehicle	4) Tempera-	ture and/or	humidity	extremes	5) Weather	6) Terrain	45:17 (6	n mgn	tion lend	COUNT TOWN	a) rersonal	eduipment	and/or	clothing	IU) Opera-	tional state																
		Function(s)/Tasks	Conduct Indirect	Pire Missions						SM Task # & Name 4) Tempera	061-283-2001		Request and Ad-	inct Area Fire	Heine Creening	Decorations		061-201-2000	7007-697-100		request and Au-	Just Final Protec-	tive Fires (FPF)		TRI: 74		References/Notes	(ew) EMC-13E	TOT ONLY (MIC)	(rgs. 2-240; 2-	- FM6-30 (Chap-										
														B-	-3	9																									

Page 2 of 3 Pages	Revision 2 Date: 3/24/84		
	Task Classification:	[ ] Procedural (Pixed, Structured)	LA Variable (Cognitive, demi-directured)
OP Occupied	requisites: Digital Comm. Established	FO/FIST Equip, Operational	
FIST		retion Position(s) FO/FIST Ch/FS Sgt	
3	}	ž	

2 of 3 Pages	2 Date: 3/24/84	J. Hamilton
Page 2	Revision	Analyst:
		Ç Ç

							(X) Variab	le (Cognitiv	[X] Variable (Cognitive, Semi-Structured) Analyst:	J. Hamilton
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	To	Time (minsec)	Performance Standard(s)	Present Assessment Method
*This is the last		Zel C	Target loca-	None		Area Fire	Self			
process common to any Request and Adjust Fire task.			ment data.		for fire	na na na na na na na na na na na na na n				
The remainder of		Sel.	Decision to	DMD/		type and	(FIST)**		5	Observe:
this analysis is			request/adjust	FIST		trans-	FDC,			• FM type
specific to Area			area fire	OWO.	(SM Task 061-	mitted	<u> </u>		90 seconds W/o procedural	• procedure
r re			tion,		(0001-017		FIST		5	• erabsed rillie
**If initiated by			• engagement				Ch/FS			
FO, message will			• command				(1) (2)			
FIST for approval.		FDC	MTO. Shot	DMD/	Press MSG kev/	Message content	Self			Observe performance
_		) 	and Splash	FIST			(FO,		key)	
sumed here.			messages	DMD	sage		FIST Ch/FS			
							Sgt)			
		<u>=</u>	Shell burst in	Binocu-			38			Measure deviations and
			zone of ob-	lars or		move subsequent			L	compare values
			servation	GTTD		adjustment to the			rections to the nearest	
					ii GLLD, per-	rarget			Fotoming agents	
					274-1979 Deter-				tions to the nearest + 50	
					mine corrections				meters.	
									GLLD	
									Determine deviation and	_
									vertical interval to nearest	
									the nearest + 10 meters	
		Self	Subsequent	/QWQ	-2	d and	(FIST)		_	Measure time to com-
			corrections	TISI C	mit subsequent	transmitted			onds W/o procedural error	piete. Observe perior=
				O E O	Regjust data (SM Task 061-273-		(FO/	•		a a lina lina lina lina lina lina lina l
					1003)		FIST			
             	 	   		1	 	             	Sgt)	1	;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
		The abo	ve two		repeated until burst at	at ± 50 meters.				
 	 	! ! ! !	         	     	1 1 1 1 1	 	i I	     		
_	_	_	_	_	_			_		_

#### SISVIANA (COI) THOTHIS SOUND BOAT WORKEN

Subsystem FIST					OP Occupied				Page	Page 3 of	3 Pages
	17 TO 1101 OF	1000		<b>3</b>	isites: Digital Comm. Established	1. Established	Task Clas	Task Classification:		Revision 2 D	Date: 3/24/84
Section Positions)	ro/risi cn/rs se	200			EO/EISTEquip. Operational	Operational		brel (Pined, le (Cognitiv	Procedual (Pixed, Structured)  X  Variable (Cognitive, Semi-Structured) Analyst:_		Hamilton
	Factors		Inputs		Process	Outputs					
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	Ę	Time	Performance Standard(s)		Present Assessment Method
			Shell bursts	DMD/	Observe bursts.	ect	(FIST)		Enter and transmit FFE	2	Determine if PFE
			+ 50 meters	FIST	Enter and trans-	data entered and	FDC		data within xx seconds w/o appropriate. Measure	w/o appr	opriate. Measure
			of target	Q WQ	mit corrections to fire-for-effect	transmitted	Self (FO/ FIST Ch/FS		procedural error	task task	time to complete sub- task
		FDC	MTO, Shot	DMD/	Press MSG key/	Message content	Seif		Respond promptly (MSG		Observe performance
			and Splash messages	FIST	read each mes- sage		(FO, FIST Ch/FS Set)		key)	<del></del>	
			FFE shell	Binocu-		Enter and trans-			Enter and transmit FFE	Mea	Measure and compare
			bursts	lars,	and effect on	mit corrections			data within xx seconds w/o values. Determine	w/o value	es. Determine
				GLLD,	target. If neces-	and FFE			procedural error	COLL	corrections if appro-
				FIST	subsequent achiest					812	and observe operator
				DMD	and HOB. Deter-					bert	performance
					mine results effective						
				4	00		C		Decised offices carional	1	Charles has surround
			rrr sneii burst	DMD FIST/	Observe rrE burst effect on	Σ O J	٠ ا		target. M within xx	<u> </u>	effect on target.
				DMD	target. Deter- EOM. Enter and				seconds after FFE bursts	-	Measure elapsed time
					transmit EOM					-	

											_	Dage 1 of 2 Berne
<b>4</b> 1	Subsystem FIST				G			i				
		FO/FIST Ch/FS Ser	5			riedusites. Digital Comn	Digital Comm. Established	Task Clas	Task Classification:	Revision	sion	Date: 3/27/84
<del>.</del> ,	Section Position(s)		ķ			FO/FIST Equip. C Limited Visibility	FO/FIST Equip. Operational Limited Visibility	Procec	lural (Fixed, le (Cognitive	Procedural (Fixed, Structured)     Variable (Cognitive, Semi-Structured) Analy	yt: J.	Analyst: J. Hamilton
_		Factors		Inputs		Process	Outputs				-	
		Affecting			Equip-				Time		···	Present
	Function(s)/Tasks	Performance	From	Content	ment	Actions	Content	2	(minsec)	Performance Standard(s)	(s)	Assessment Method
	Conduct Indirect	1a) Visibility Self	Self	Hear possible		Decision to	Initiation of task Self	Self		Detect/orient sound		Observe performance
	Pire Missions	environmen- (FO/	(FO/	target noises,		request artillery	_	[(FO/			_	
		tal	FIST	e.g., weapons		fire		FIST				
	SM Task # & Name 1b) Visibility Ch/FS	1b) Visibility	Ch/FS	firing,				Ch/FS				
	061-283-2004	equipment	Set)	vehicles or				Sgt				
	(FO/FIST Ch/FS	3) Moving		troop	Мяр	Estimate target	Estimated	Self		Direction expressed to the	he	Observe and compare
	Set)	vehicle		movements	M2	location by	direction and	(FO/	•	nearest ± 10 mils within		values
		4) Temper-			Com-	estimating	distance to	FIST		200 meters of actual		
	Request and	ature and/or			pass	distance and	target location	Ch/FS		direction		
	Adjust Area Fire	humidity				direction		Set		Distance expressed to the	the	
 }_	Using Sound	extremes								nearest ± 100 meters		
		5) Weather	Jies Seli	Knowledge of:	None	Select method	Data for selected Self	Self	-	Selected method is appro-		Observe performance
	Procedures	6) Terrain		engagement		of engagement	method			priate		
_		7) High		options, de-			adjustment					
	TRI: 89	communica-		sired effect,			<ul> <li>trajectory</li> </ul>				_	
		tion load		command			ammunition					
	References/Notes	9) Personal		guidance.			• fuze		_			
	4000	equipment		Target data			• fire volume					
	• (SM) FM6-13F	and/or					<ul> <li>fire distribution</li> </ul>				7	
	Pg. 2-250 -	clothing	Self	Knowledge of	None	Select method	Data for selected Self	Self.		Selected method is appro-	_	Observe performance
	162-2	IUJ Opera-		firing method	_	of firing	method			priate		
	• FM 6-30, Pg.	tional state		and command			<ul> <li>number of guns</li> </ul>					
	07-0	_		guidance			• Interval		-		+	

Assessment Method Observe performance Observe performance Observe performance Revision 2 Date: 3/24/84 elapsed time Present procedure Analyst: J. Hamilton • FM type Observe: Page 2 of 2 Distance estimated by multiplying # of seconds from impact to sound reaching Lateral deviation estimated by difference of direction (burst and target location). Enter and transmit appropriate FM data within 90 seconds w/o procedural Performance Standard(s) Respond promptly (MSG key) observer by 350 meters | J Procedural (Pixed, Structured) |X| Variable (Cognitive, Semi-Structured) error minsec Task Classification: Time Self (FO, FIST Ch/FS Sgt) (FIST) Ch/FS Sgt) FDC, (FO, FIST Sei Message type and (FM data trans-Fm ditted Message content Estimated dis-tance to target Determine direc-Estimated shift Outputs Prequisites: OP Occupied
Digital Comm. Established
FO/FIST Equip. Operational Content Area Fire selected pact. (Number of sound adjustment by measuring seconds it takes to reach observer from expected time of im-Press MSG key/ read each mesmated distance) Determine dis-tance to burst seconds X 350 sound of burst meters = esti-(SM Task 061-Select\* appropriate request for fire Enter/transmit FM-DMD/FIST Actions Alert FDC: 273-1003). Process sage Equip-M2 Comment DMD/ FIST DMD DMD/ FIST DMD None request/adjust target loca-• engagement • command Sound and/or flash of burst Target location. Engage-Firing data Decision to ment data. guidance and Splash Content MTO, Shot messages area fire tion, Self (FO/ FIST Ch/FS Sgt) From FO/FIST Ch/FS Set FDC Sei C Performance Affecting Factors \*\*If initiated by FO, message will be transmitted to FIST for approval. Approval is assumed here. process common to any Request and Adjust Fire task. The remainder of this analysis is FIST Function(s)/Tasks This is the last specific to Area Fire. Section Position(s)

and all the second of the seco

correc-

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Apply W

tion to target by in meters to tar-

get from burst

measuring direc-

pass

tion to burst

estimated direcand compare to

and determine

lateral shift

tion to target

tions

Bran 1 20 1		Bautaine O Date: 7/96/84	10/04/	Asselyet:
		That Classification:	( ) Procedural (Pixed, Structured)	Observed Constitution to EDC (X) Variable (Capalitive, Semi-Structured)
	OP Occupied	Prequestes: Digital Comm. Established To	I RE Organional	Observed I continue to EDC
	FIST		Section Position(s) FO/FIST Ch/FS Sgt	

	Factore		Inoute		Process	Outputs				
	Affecting			Found-				Time		Present
Function(s)/Tasks	و_	From	Content	ment	Actions	Content	ę	(minsec)	Performance Standard(s)	Assessment Method
Conduct Indirect	Į	Self	Permanent/		Need to deter-	Initiation of task	Self		None, until task initiated	Observe performance
Fire Missions	environmen-	(FO,	semiperma-		mine grid loca-		(FO/			
		FIST	nent object		tion of unknown		FIST		-	
SM Task # & Name	1b) Visibility	h/FS	near center		point near center		Ch/FS			
061-283-2005	equipment	Sec			of sector		Set.)		_	
(FO/FIST Ch/FS	3) Moving				Determine direc-	Direction to			o point expressed	measure and compare
(2.8)	Venicle		able to orient	3 E	TION (SM 001-203-KIROWII DOING	KIRWII DOIIIL				Agines
Post Carrier Contract	turn and/or			3900					Tion	
tion of loante on	ture and/or			1 10 1	Dotosmino die-	Distance in	9		Distance accurate to + 10	Measure and compare
Hotown Point on	extremes				tence with LRF	meters to known	F0		_	values
the Ground by	5) Weather				061-283-1952	noint	FIST		1	
the Indirect Fire	6) Terrain				***************************************		Ch/FS			
Technique	7) High						3			
	-8010110100			DMD/	Perform SM 061-	Transmit FM			Call for fire data complete	Observe performance
TRI: 74	tion load			FIST	273-1003 or	data which in-			w/o procedural error	
	9) Dereonel			C MC	Aminyalent FIST	olides work cen-		_		
Doforosonoso Notos	9) rei sonai				DMD tock	ter of sector and				
neierences/notes	בלתולווויבוווי				Lash Lash	יייי ל הריון				
CM) EM C-13E	and/or				(enter and trans-	type of smell,				
(Pg. 2-252)	9		SHOT and	/GMG	Proce MSG key/	Message content	Jies		Respond promptly (30 secs.) Observe performance	Observe performance
			100		road open mos-		(FO			
OF DEL					נפעס בפכוו וווכט		FIST			
					2906		() () ()			
	•		burst				Set)			
				Binocu-	Determine devia-	Enter and trans-	Jig Seit		Adjustment continued until	Observe performance
				lars,	tion and range	mit subsequent			FFE complete	
				LRF,	corrections to	adjustment data	FIST			
				DMD,	move burst on		Ch/FS			
				FIST	target		Set).			
				DMD	(Repeat adjust-		FDC			
					ment procedure					
	-				until FFE					
				970	acnieved)	Caid accading to	243		Proceed resid location on	Obcomo nortono
			-moa	DMD,	request and re-	Grio coordinates	֝֝֟֝֝֝֟֝֝֝֟֝֝֡֝֝֟֝֝֡֡֝		Record grid location on	Ooserve periorinance
			plete	ISI C	ceive grid coor-	oi object lired			map terrain sketch, etc.,	
				3	uniates or point	3			subsequent targets	
-	-	-	_		_	_	-	-	_	

Date: 3/27/84 Task Classification:
[ ] Procedural (Fixed, Structured)
[X] Variable (Cognitive, Semi-Struc Prequisites: Digital Comm. Established FO/FIST Equip. Operational FO/FIST Ch/FS Sgt Section Position(s)

of 2 Pages Analyst: J. Hamilton

		Fuotosc		Invite		Process	Outouts				
_		Affecting		CINON I	Foling				Time		Present
Func	Function(s)/Tasks	<u>۔</u> ۔	From	Content	ment	Actions	Content	To	(minsec)	Performance Standard(s)	Assessment Method
Comp	Conduct FPE	2	Self	Suppressive		Decision to con-	Initiation of task	Self	00:00	None until task initiated	Observe performance
Mission	£	environmen-		fires ineffec-		duct immediate		FO/			
		tal		tive or need		smoke/quick		FIST			
		1b) Visibility		to deny enemy		smoke		Ch/FS Set			
		3) Moving		Type of wind	Rinocu-	Observe wind	Type of wind	Self		Interpret wind correctly	Observe performance
		vehicle		conditions.	lars		condition in area	FO/			•
		5) Weather		Possible ad-		area to be ob-	to be obscured	FIST			
SM Te	SM Task # & Name			ing point for		scured and de-		Ch/FS			
061-28	061-283-2021	7) High		smoke		termine type of		Sgt			
		communica-				wind (cross, head					
	Conduct an Imme-	tion load				or tail wind)					
diate	diate Smoke	_				Select an adjust-Selection of an	Selection of an	Self			Evaluate appropriate-
	Ĕ					ing point based	adjusting point	FO/			ness of selected point
						on wind condi-	for smoke to	FIST		ditions and desired obscura-	
061-2	061-283-2022					tions. Tail wind	obscure enemy in			tion effects	
						-at least 200	relation to MT	Sgt			
Build	Build and Maintain					meters short of	line				
	Oniak Smoke				_	termet on the					
Seree	ich Sillone n					MT line					
	•			Previously	Binocu-	٠.	Adjusting point	Self		Adjusting point location	Measure time required
TRI	74			fired suppres-	lars/			(FO/			to accurately locate
	•			sive rounds	LRF/	point by:	_	FIST		within xx seconds	adjusting point
Rofor	References/Notes	-		and/or selec-	0110	061-283-1002		Ch/FS			
1	circs/ mores			ted adjusting	Man	(Grid)		Set.)			
WS)	(SM) FMG-13F			roint	Target	061-283-1003		•			
(Pg	s. 2-254.				List	(Polar)			_		
2-2	2-263)					061-283-1004					
FW	FM6-30					(Known point)					
						061-283-1952					
						061-283-1953					
						(LRF)					
						061-274-3973					
						061-274-3974					
						061-274-3976					
						061-274-3077					
						(GTTD)					
_						as appropriate					
_		-		_	-		_	_	_	_	_

1. T.

Section Positionis)	FO/FIST Ch/FS Set	'S Set			Digital Comm FO/FIST Equi	Digital Comm. Established FO/FIST Equip. Operational	Task Case (1) Proced	'ask Classification: J Procedural (Pixed, KI Variable (Cognitiv	Task Classification:  [ ] Procedural (Pixed, Structured)  [X] Variable (Cognitive, Semi-Structured)  Analyst:	Revision Date: 3/27/84 Analyst: J. Hamilton
	Factors		Inouts		Process	Outputs				
	Affecting			Equip-				Time		Present
Punction(s)/Tasks	Performance	From	Content	ment	Actions	Content		(minsec)	Performance Standard(s)	Assessment Method
•If initiated by			Adjusting	DMD/	Enter and trans-	Message type and (FIST)*	(FIST)*		Enter and transmit appro-	Evaluate FM message
FO, message will			point location	FIST		FM data trans-	FDC,		priate FM data within 90	selected, completion
be transmitted to			and desired	DWD	using DMD/FIST	mitted	Sel		seconds w/o procedural	of data fields.
FIST for review/			effects		-190 MS) QMQ		(FO/		error (150 seconds for	Measure time
approval.					273-1003) (simi-		FIST		quick smoke from identifi-	
					lar task for		Ch/FS		cation to transmittal)	
		2	MAD SHAP	hwh.	Posd oach mes-	Knowledge of	3		Mossages proposed	Observe performance
		3	and SPI.ASH	FIST	בשפה בשכון ווובים_	message contents	(FO)	-	nessages processes promptly	
			TIPOCEBODE	Q Q	3	2000	FIST		Trains de	
			9	)			Ch/FS			
		9	Shell harrette)	Ringelle	Observe burst(s) Subsequent cor-	Subsequent cor-	3 3		If immediate smoke	Observe burst effects
-		, (2)	(a) (a) (a) (a) (b) (a) (b) (b) (a) (b) (b) (b) (b) (b) (b) (b) (b) (b) (b	Jone	If immediate	rections if any	(EO/	, ·	obscure target before third and subsequent adjust-	and subsequent adia
		FIST		GLLD	smoke, determine		FIST		round (SM). If quick smoke, ments. Evaluate	ments. Evaluate
		Ch/FS			effectiveness.		Ch/FS		transmit corrections for	performance
		Set)			If quick smoke,		Sgt)		HE until near adjusting	•
		· _			HE adjust, deter-		)		point	
					mine required					
			Burst(s) at or		Enter and trans-	FFE smoke data	(FIST)*		Appropriate FFE within	Observe performance
			near adjusting		mit FFE smoke	transmitted	FDC,		xx seconds w/o procedural	and measure time
			point		data		Sel		error	
							(FO/			
							7. F.			
							Set)			
			MT line	Binocu-	Observe effec-	EOM and results	(FIST)		When smoke effective,	Observe performance
			effectively	lars,	tiveness of	transmitted	FDC		transmit EOM	
			opscared	DMD/	smoke. Enter		<u>=</u>			
				FIST	and transmit		(FO/			
				3			Ch/FS			
							28			

	Fuotore		Inouts	-	Process	Outputs				
	Affecting							Time		Present
Function(s)/Tasks	Performance	From	Content	ment	Actions	Content		(min:sec)	Performance Standard(s)	Assessment Method
Control Provision	1a) Visibility FDC	FDC	Message to	DMD/	že	f task	Self		Message processed promptly	Observe performance
Designation	oninon-	)	ondiot in-	FIST	contents					
Crist and Time	tell virolinicii		٥	O M C						
	14.1		-	\ : :						
	10) VISIBILITY		known RP							
	2) Moving	J log	RP location	Binoeu-	Observe and	OT direction to	Self		OT direction within xx	Measure and compare
	Suracian (c	1136	4	10.00					mils of actual direction	values
	Venicle			Tonesin	3360	129				
			Servation	ierrans.	Carrig compass,					
SM Task # & Name	_			Sketch/	measure and			_		
061-283-2102				larget	determine			_		
	communica-			List,	observer-target					
_	tion load			M2	(O.I.) direction					
Conduct an Impact 9) Personal	9) Personal			Com-			_			
and Time	equipment		,	pass		╛				14
Registration	and/or			GLLD/	1		Self	_	_	Measure and compare
0	clothing			LRF	determine OT	OT factor		_	_	values
TRI: 74	10) Opera-				PO				factor to nearest 100	
	tional state				factor		_		meters	
Dofordanda /Notos	210101				061-283-1952					
neier ences/ noice					(I.R.F.)					
					061-974-3973					
					(CTTD)			_		
		3	Target loca-	DMD/	Enter REG data	REG data en-	FDC		Registration data entered	Observe performance
		į	tion: OT	FIST	using appropria-	tered on DMD/			and transmitted w/o pro-	
			direction	N C	ate message	FIST DMD and			cedural error	
			מוובכרוסוו	ב ב	formet and	transmitted				
					transmit data					
Carataca Use Ids#		נייכ	SHOT and	DMD/	Read message	Knowledge of	Self		Messages processed	Observe performance
optional		3	SPLASH*	FIST	contents	message contents			promptly	
		19	Sholl huret	Rinoell	Observe burst	Corrections re-	Self		Range and deviation cor-	Measure and compare
		;	10 10 10 10	lare a	and measure	ouired to bring			rection accurately deter-	values
				3	deviation (OT	round onto OT			mined w/o procedural	
_					fector) and	line prior to			error (SM)	
					lactor) and	114411-1200				
					determine range	spirting 200- meter bracket				
							-			
_	_	_	_	_	_	_	_	-	-	_

Promission: OP Occupied: Position Known

I CI J				Pega	Prequisites: V. V. V. United. Lunitation Duowii	TOTAL PROMIS	That Class	Thak Classification:		
Section Position(s)	FO/FIST Ch/FS Set	'S Set			FO/FIST Found Constinued	Digital Comm. Established FO/FIST Follin Operations)	K) Proces	heal (Fixed,		3/21/84
		,				18mmmar 4	[ ] Verieb	le (Cognitiv	[ ] Variable (Cognitive, Semi-Structured) Analyst:	J. Hamilton
	Factors		Inputs		Process	Outputs				
Dunetion(c) /Torke	Affecting	2	1	Equip-	Actions	Content		Time	Porformance Standard(c)	Present Assessment Method
T	reriormance	rrolli	Tuality C		_	Collicing	0,000		Т	Observe performence
			Pange correct	FIST	mit REG cor-	tered and trans-	3			Cooci to boil of manor
			tions required	DMD	rections	mitted			procedural error	
			to bring burst on OT line							
		FDC	SHOT and	DMD/	Read message	Knowledge of	Self		processed	Observe performance
·			SPLASH mes-	FIST	contents	message contents			promptly	
			Shell burst	Binocu-	Observe burst;	Range corrections Self	Self		Range corrections accu-	Measure and compare
				lars	e.	to split 100-			rately determined w/o	values
					corrections to	meter bracket			procedural error (SM)	
					split 100-meter					
			Range correct	DMD/	_	Corrections on-	FDC		Correction data entered	Observe performance
			tions required	FIST	mit REG range	tered and trans-	2		and transmitted w/o pro-	
			to split 100-	DMD		mitted			cedural error	
			meter bracket							
		FDC	SHOT and	DMD/	Read message	Knowledge of	Self		Messages processed	Observe performance
			SPLASH mes-	FIST	contents	message contents			promptly	
1 1 1		1	OWO					1		
The above	tour process	Sare	peated as redu		erine the ourst log	ation to + meters	or targ	)		
	 	Self S	Shell burst			Desired time of	Self	     	HOB achieved	Observe performance
air, request cor-					burst at desired	НОВ				
rection until			Desired HOB	DMD/	trans-		FDC		Transmit request w/o delay Observe performance	Observe performance
desired height			achieved	FIST		quested			and w/o procedural error	
		203	SHOT mos-	DMD/	Road SHOT	Knowledge of	19		Possocou enesseM	Observe performence
		) 1	sege	FIST	message	SHOT message		•	promptly	
				DMD						
		_								
-			_	_			_	_	_	

	1					<u>ə</u>	
	27/84			Present Assessment Method	lues	Observe and evaluate performance	
3 Pages	Date: 3/27/84	J. Hamilton	,	Present Issessment	Compare values	Observe and performance	
٥			_	_	රි		
Page	Revision	Anelyst:		andard(s	correct er HOB	and tin rmed w (SM)	
		(paint)		ance St	nt data 20-met	impact on perfo	
		Semi-Struck		Performance Standard(s)	Refinement data correct to obtain 20-meter HOB	Precision impact and time registration performed w/o procedural error (SM)	
	ention:	IX) Procedural (Fixed, Structured)  [ ] Variable (Cognitive, Semi-Structured)		Time (minsec)		4 5 0	
	Task Classification:	Variable (		To T		ပ	_
1		<b>E</b>			8	a FDC	 
n Know	ished	ational	Outputs	ent	burst nt data	ent data 1 data ted	
OP Occupied: Position Known	Digital Comm. Established	FO/FIST Equip, Operational		Content	Required burst refinement data, if any	Enter refinement Refinement data data and record and EOM data as time registra-transmitted tion	
cupied	Comm	ST Equi		-	burst deta, remeter	ecord gistra-	
O d O	Digita	FO/FI	ess	Actions	Determine burst refinement data, if any, to achieve 20-meter beight of burst	Enter refinemendata and recordas time registration	
			Process			Enter data as ti tion	
	Ē			Equip-		DMD/ FIST DMD	
	!			į.	Observe three bursts	efine- alues M	
			Inputs	Content	Observ bursts	HOB refinement values and EOM	
	3	je Š		For	Self		
	Ch/FS		Factors	Affecting			
	FO/FIST Ch/FS Set		Fac	Perfor			
FR	2			Tasks			
				Function(s)/Tasks			
3			L				

										,
Subsystem FIST				Prenuisites		plished	7	Tout Cleanification.		5 
Section Position(s) F1	FIST Ch/FS Sgt				Digital Comm. Established	Established	IXI Proces	dural (Pixed	Revision	Date:
1					FRA or Auto Mode	to Mode	Variab	de (Cognitiv	Variable (Cognitive, Semi-Structured) Analyst:	
	Factors		Inouts		Process	Outputs				
Filmotion(s)/Tacks	ho 8	From	Content	Equip-	Actions	Content	To	Time	Performance Standard(s)	Present Assessment Method
		FO	Fire mission	FIST	Review Mode		1			
	-darkness		related mes-	DMD	Press message	Message content Self	Self	00:00	MSG key is pressed	Observe message dis-
	3) Moving		sages		key	displayed and			promptly (Draft-OM)	played promptly
	vehicle					read				
_	4) Tempera-				Determine to	Decision to ap-	JlaS		Decision to approve mes-	
	ture/humidi-				approve displayed	prove message			sage made promptly	
	ty				message				(Draft-OM)	
SM Task # & Name 5) Extreme	5) Extreme			FIST	Press XMIT key	ACK indicator	FO		XMIT key pressed without	Observe XMIT key
TBD	weather			DMD		lighted	Self		delay (Draft-OM)	pressed promptly
	(snow, rain,				OR					
Control/Coordinate sleet)	sleet)				Determine to	Decision to dis-	Self		Decision to disapprove	
FM Data Using	(6) Type of				disapprove dis-	approve message			message made promptly	
FIST DMD* (FIST) terrain (flat,	terrain (flat,				played message				(Draft-OM)	
	hilly, rolling,			FIST	Readdress mes-	Readdressed	FO		Readdress message without Observe readdressed	t Observe readdressed
TRI: Not Deter-	mountainous)			DMD	sage to FO	message	Self		error (Draft-OM)	message
mined	7) High			FIST	Press XMIT key	ACK indicator	FO		XMIT key pressed without	Observe XMIT key
	communica-			DMD		lighted	Self		delay (Draft-OM)	pressed promptly
References/Notes	tions load				AUTO Mode					
	9) Personal			FIST	No FIST action	No FIST action				
• Fire Support	equipment			DMD	required	required				
Team Digital	_				FRA Mode					
Message Device	_			FIST	Press message	Message content Self	Self		MSG key is pressed	Observe message dis-
AN/PSG-5,	mask)			DMD	key	displayed and			promptly (Draft-OM)	played promptly
Operator's	10) Opera-					read				
1.0							,			

Observe readdressed message

Readdress message without error (Draft-OM)

Decision to disapprove message made promptly (Draft-OM)

Observe XMIT key pressed promptly

without

XMIT key pressed delay (Draft-OM)

Self For

Readdressed message ACK indicator lighted

FIST DMD FIST DMD

Determine to disapprove dis-played message Readdress mes-sage to FO Press XMIT key

Observe XMIT key pressed promptly

Decision to approve message made promptly (Draft-OM) XMIT key pressed without delay (Draft-OM)

FO

ACK indicator lighted

approve displayed message Press XMIT key

FIST

OR

Determine to

10) Operational state

Manual (Draft) Operator's

(enemy action, target load, com-

O & O Plan
FIST UMD
This DMD Task
Supports Several
Functions

mander's guidance

\*FIST DMD boarded tasks not available

Decision to ap-prove message

હ્યુ

Decision to dis-approve message

D) ANALYSES
EPO.
INPUT-PROCESS-OUTPUT
ENGAGE
TEAM
GUNNERY

1.에 그렇 몇호 [호호호   영호분 [영호   영호	Subsystem FDC				Prequ	Prequisites: BCS Initialized	zed m Established	Tesk Cles	Task Classification:	Bevision ()	0 Date: 3/22/84
The Fetors Affecting Equipment Process Coulous Standards From Content ment Prints Set I always Process Coulous Set I always Process Coulous Set I always Content ment Prints Set I always Communication of task Set I always and Chart Page Communication of task Set I always and Chart Page Communication of task Set I always and Chart Page Communication of task Set I always and Chart Page Communication of task Set I always and Chart Page Communication of task Set I always and Chart Page Coulous Set I always and Chart Page Page Coulous Set I always and Chart Page Page Coulous Set I always and Chart Page Page Coulous Set I always and Chart Page Page Coulous Page Page Coulous Page Page Coulous Page Page Coulous Page Pa	Section Position(s)	Computer (B	CS Oper	rator)		DIKITATI OF		IX) Proced	heal (Pixed		1 3
Time Furing   Process									11 march 24		
Affecting   Affecting   Affecting   Bart		Factors		Inouts		Process	Outputs				
mile Fring (a) House (b) Authbe alam BCS (c) Authbe alam BCS (c) Authbe alam and PIRE MSN (c) House (c) Ho	Eurotion(c)/Tocke	Affecting	Geom	Content		Actions	Content		Time	Performance Standard(s)	Present Assessment Method
tell lamp on BCS ALARM FM: RATA mes- Self ALARM ACK key and equipment communication because the self and RCVD MSG seg displayed message communication because the communication because the self and RCVD MSG seg displayed message communication because the self and RCVD MSG seg displayed message communication because the self and RCVD MSG seg displayed message communication because the self and RCVD MSG seg displayed message communication because the self and RCVD MSG seg displayed message communication because the self and RCVD MSG segs displayed message communication segretary and shift from a segar segretary and shift from a segar segar displayed message control and shift from a segar segar displayed message control and shift from a segar segar displayed message control and chart Opera- loc.    Alaxa Mission   RCCK key and RCVD MSG segs control and Chart Opera- loc.   Rectly repeated communication segar segar control and shift from a segar	Determine Piring	2	FO/	Audible alarm	BCS	Observe alarm	Initiation of task		00:00	Message alarm and FIRE	Observe performance
Pics   Pics	Deta		FIST	On FIRE MSN		and FIRE MSN				ואוסוע זמווולן מספר אפת	1.
A CK key once sage displayed RCVD MSG communication and RCVD MSG communication and RCVD MSG communication to be a communication of the communication of the communication of the communication of the communication of the communication of the communication of the communication of the communication of the communication of the communication of the communication of the communication of the communication of the communication of the communication of the communication of the communication of the communication of the computed of the computed of the communication of the computed		(2b) Noise			BCS	Press ALARM	FM; RFAF mes-	Self		ALARM ACK key and	
Personal		equipment				ACK key once	sage displayed			RCVD MSG keys are	message displayed
BCS   Announce discrete   Displayed message contents and chart   Displayed message contents and chart   Displayed message contents and chart   Depart   Displayed message contents and chart   Depart	:	7) High				and KCVD MSG				pressed prompting	
Thingaine to the contents fund the contents fund to the contents fund to the contents fund the contents fund the contents fund the contents fund the contents fund the contents fund the contents fund the contents fund the content for the content content for the content content for the content content for the content	SM Task # & Name	communica-			900	Application dis-	Displayed mes-	FDO		Displayed message cor-	Compare displayed
tional state  PDO issued Fire BCS Make appropriate Mossage reviewed FDO, border Review message Displayed gun RDO, pretator orders for commends and press EXEC orders or commends and press EXEC orders for commends and press EXEC orders for commends and press EXEC orders for commends and press EXEC orders for commends to transmit Can frame displayed on BCS and press EXEC orders for commends for commends and press EXEC orders for commends for commends and press EXEC orders for commends for commends and press EXEC orders for commends for	061-279-2002				2	Announce dis-	come contents en-	Chart.		rectly repeated	message to repeated
tional state  Honor state  Hono	061-279-2003					piayed incasage		Opera-			message
tional state  10) Operaction and Shift from a from who point) to peraction point) to present tional state  EDO lessued Fire BCS Make appropriate Message reviewed FDO, and certies in accor- FM; RPAF reduces with FDO freets FDO fire requested action order and press ENEC orders on BCS for that Gun Orders PDO, promptly when desired FM; RPAF is correct Review Gun.  BCS Review Gun. Determination Self, promptly when desired FM; RPAF is correct and profess for complete or pieteness/accu- accurate for the Gun Orders PDO, pressed promptly fire commands How ty; polling status displayed on BCS. Press XMIT key Fire commands How ty; polling status displayed on BCS sage displayed on BCS. Sage displayed on BCS sage displayed on BCS. Sage displayed Sage displayed Sage displayed Sage displayed Sage displayed Sage displayed Sage displayed Sage displayed Sage displayed Sage displayed Sage displayed Sage displayed Sage display	(BCS Oper.) 161-					ing Grid Coordi-		tor.			1
tional state    FDO   Saued Fire   BCS   Make appropriate   FDO   Message reviewed   FDO   Message content correctly	\$007-67Z					nates. Polar Plot	tor	Self			
FDO Issued Fire BCS Make appropriate Message reviewed FDO, BC BC Granter Generation order dance with FDO forder BCS Review Gun BCS Review Gun BCS Review Gun BCS Review Gun BCS Review Gun BCS Review Gun BCS Press XMIT key BCS Press XMIT key BCS Press XMIT key pressed promptivities for commands and to the form of the f		10) 000				and Shift from a					
FDO and Chart   Char	Determine riring					trough point) to					
FDO Issued Fire BCS Make appropriate Message reviewed, FDO, Message content correctly entered dance with FDO fleter FDO fire FDO	Data Using the	_				EDO and Chart					_
Target Logical	BCS (Area Mission					PLDO BING CHBI C					
by Grid  Tyd  Todar  Shift from a Point  Review message bisplayed gun PDO, EXEC key pressed dance with FDO fleets FDO fire  Review message Displayed gun PDO, EXEC key pressed and press EXEC orders on BCS  Review Gun Determination Self, Gun Orders reflect FDO's Orders for complete/  11-7440-283-  11-7440-283-  Review Gun Determination Self, Gun Orders reflect FDO's Fire Order pleteness/accu— are complete/  1-1 (Advance BCS XMIT key Fire complete/  1-1 (Advance BCS XMIT key Fire complete/  1-2 (Advance BCS XMIT key Fire complete/  1-3 (Advance BCS XMIT key Bressed promptores to tensmit Gun frensmit	for a Target Lo-		0		200	Operator	Moscogo povious	FDO		Message content correctly	Compare Fire Order
In Point  Note deficient with FDO flees FDO fire  Shift from a requested action order  To Point	cated by Grid		۲. ا	Issued rire	ر ا	Make appropriate	EM. DEAR no-			entered	content with displayed
Shift from a requested action order and press EXEC Review message Displayed gun FDO, BEEC key pressed and press EXEC orders on BCS Review Gun BCS Review Gun Determination Self, Gun Orders reflect FDO's Orders for complete/ are complete/ are complete/ BCS Review Gun Determination Self, Gun Orders reflect FDO's Orders for complete/ are complete/ BCS Press XMIT key Fire commands How Iy; polling status displayed, blayed on BCS; FM; MTO message displayed on BCS; FM; MTO message displayed on BCS sage displayed on BCS; FM; MTO message displayed on BCS sage displayed sage displayed on BCS sage displayed sage	Coordinates, Polar			- Order		entries III accor-		1			RFAF
Point BCS Review message BDisplayed gun FDO, EXEC key pressed and press EXEC orders on BCS Self RFAFE; Represed FM; Review message Displayed gun BCS Review Green BCS Self RFAFE; Correct FDO; RAPAFE; Correct FDO; BCS Review Gun Determination Self, Gun Orders reflect FDO's Orders for complete/ are complete/ are complete/ accurate to the transmit Gun Gun Gun Gun Gun Gun Gun Gun Gun Gun	Plot, Shift from a					dance with r.D.o.					
rences/Notes  BCS Review Gun BCS Self RPAF is correct key BCS Review Gun Determination Self, Gun Orders From Computy when desired FM.  11-7440-283- 1-1 (Advance BCS Teach BCS Self BRAF is correct are complete/ are complete/ are complete/ are complete/ are complete/ are complete/ are complete/ are complete/ are complete/ are complete/ by. Chapter 3.  BCS Press XMIT key Fire commands How XMIT key pressed prompt- polling status displayed, Orders to Howit-Howitzer Section, polling status displayed on BCS, BCS BCS Belf, Gun Orders FDO FM: MTO message displayed on BCS, BCS BCS BCS BCS BCS BCS BCS BCS BCS BCS	Known Point				000	requested action	_	600		EVEC boy proceed	Compare displayed
and press EAEC orders on Determination  11-7440-283- 11-7					S S	Keview message	Dispigação	, J		promotive when desired FM:	orders with Fire Orde
TMI1-7440-283- TMI1-7440-283- TMI1-7440-283- TMI1-7440-283- TMI1-7440-283- TMI1-7440-283- TMI1-7440-283- TMI1-7440-283- TMI1-7440-283- TMI1-7440-283- TAGVANGE  TACOPY, Chapter 3, Pice complete/ BCS Press XMIT key Fire commands How XMIT key pressed promptorer or transmit Gun transmitted to Sec Fr. Fire Order Iv.; polling status displayed on BCS. FM: MTO message displayed on BCS.						and press EAEC	orders on	į,		RFAF is correct	
TMI1-7440-283- TMI1-7440-283- TMI1-7440-283- Tacy Chapter 3, Chapt					900	Desired Cur	Determination	19		Gun Orders reflect FDO's	Compare displayed Gu
TMI1-7440-283-  Tacy Pleteness/accu accurate  Tacy Press XMIT key Fire commands  Topy, Chapter 3, The Commands  Topy, Chapter 3, The Commands  Topy, Chapter 3, The Commands  Topy, Chapter 3, The Commands  Topy, Chapter 3, The Commands  Topy, Chapter 3, The Commands  Topy, Chapter 3, The Commands  Topy, Chapter 3, The Commands  Topy, Chapter 3, The Commands  Topy, Chapter 3, The Commands  Topy, Chapter 3, The Commands  The Commands	References/Notes				2	Review Guit	_	FDO.		Fire Order	Orders to Fire Order
TMII-1440-283- TMII-1440-283- TMII-1440-283- Tacy Chapter 3, Tacy BCS Press XMIT key Fire commands How Transmitted to Copy, Chapter 3, To transmit Gun transmit G						orders for com-	_	2			request
BCS Press XMIT key Fire commands How XMIT key pressed prompt- to transmit Gun transmitted to Sec ly; polling status displayed, Orders to Howit-Howitzer Section; Doubling status displayed on BCS; FM; MTO message displayed on BCS, FM; MTO message displayed on BCS, BCS	•					bieteness/accu-	are complete/				<u> </u>
Hess XMII key rife commands  to transmit Gun transmitted to Sec ly; polling status displayed;  Orders to Howitzer Section;  Zer Section played on BCS; FM; MTO message displayed on BCS; BCS sage displayed on BCS; BCS Section played on BCS; FM; MTO message displayed on BCS; FM; MTO message displayed on BCS; BCS Section played blayed  12-1-1 (Advance					racy	accurate			VMIT Low proceed prompt-	+	
to transmit cun transmitted to Sec 17; politing Orders to Howitzer Section; PM; MTO Sec 18; played on BCS; FM; MTO message displayed on BCS Section played	Copy, Chapter 3	_			BCS	Press XMIT key		MOLI		him applied status displayed:	_
Orders to Howitzer Section; zer Section polling status displayed on BCS; FM; MTO message displayed on BCS	Pg. 3-18)					to transmit Gun		o Sec		ly; politing status displayed,	
polling status displayed on BCS; FM; MTO message displayed on BCS			_			Orders to Howit-				rivi; wild illessage dis-	
played on BCS; FM; MTO mes- sage displayed on BCS						zer Section	polling status dis-			piayed	
Sage displayed on BCS							played on BCS;				
Sage displayed on BCS							FM; MIO mes-				
		_					sage displayed on				
							BCS				

Task Classification:

[X] Procedural (Pixed, Structured)

[ I Variable (Cognitive, Semi-Structured) Prequisites: BCS Initialized
Digital Comm. Established Computer (BCS Operator) Section Position(s)

	Date: 3/22/84	Preusser
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	Revision	Analyst:

	Assessment Method	8	tion on BCS	Observe FM FOCMD	SHOT message dis-	played			Observe READY and	FIRE SHOT indication	on BCS		Observe SHOT message				-			Observe XMIT key	pressed correctly		_					Observe Alarm and	FIRE MSN Lamp off			Compare announced	message content with	displayed message con-	ı	 -	
	Performance Standard(s)	Observe ACK indication on	BCS display	FM: MTO message trans-	mitted to FO; FM; FOCMD;SHOT message dis-	SHOT message displayed	)	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	Observe READY and FIRE	SHOT indication on BCS	display		SHOT message transmitted	promptly						XMIT key pressed 10	seconds before impact; FM; pressed correctly	RFAF message displayed						ALARM ACK and RCVD	MSG keys pressed promptly	•		Message content correctly	repeated				
	Time	1																																			_
	Ę	<u></u>	FDO	P.O.	) •				Sel.	FDO			P.O	Self						FO,	FDO							Self				FDO,	Jis				_
Outputs	Content	DATA/ACK indi-	cation received	FM: MTO mes-	sage transmitted	to FO; FM;	FOCMD: SHOT	message displayed	ج	Ţ	indication re-	ceived from How	EM. FOCMD.	SHOT message	transmitted to	FO. FM: FOCMD	SPLASH message	displayed: count-	down initiated	FM; FOCMD:	flight 10 seconds SPLASH message	transmitted to	FO; FM; RFAF	message displayed	with ballistic	computations	entered in appro-	FM: SUBS mes-	sage displayed			Message re-	viewed and an-	nounced to FDO			_
Process	Actions	Monitor our	polling status	Droce YMIT Lov	to transmit FM:	MTO message			Monitor gun	ready/firing sta-	tus		Prose XMIT Lov	to transmit FM:	FOCMD: SHOT	message: start	Solash count-	down		Observe time of FM; FOCMD:	flight 10 seconds	to impact; press transmitted to	XMIT key 10	seconds perore	impact of round	to transmit	FM; FOCMD: entered in ag	Press ALARM	ACK key once	and RCVD MSG	key twice	Review message	and interact	with FDO per	SOF		
	Equip-	BCS.	) }	9.Ja	3				BCS				aCc.	<b></b>	Watch					BCS,	Stop	Watch						BCS				BCS		_			
Inputs	Content	Gun ACK							Gun READY	and SHOT																		Audible alarm	on. FIRE MSN	<b>Lamp</b> on	•						
	F.	more and	) Sec			_			How	ည္တင္သ																		F0/	FIST	! !							_
Factors	Affecting	201101101101																																			_
	Function(s)/Tasks										_					_									_			Note: When dis-	played messages	do not reflect rue	Order, BCS Opera-	tor makes appro-	priate manual	entries in message	lieio(s).		
												B-	53	ì.																							

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					10:4:-1	7			<i>I</i>	Page 3	of 5 Pages
Surgistem r D				Pre-	Prequisites: Digital Comm.	Digital Comm. Established	Task Cle	Task Classification:		Revision 0	
Section Position(s)	Computer (BCS Operator)	S Oper	ator)				X Proce	dural (Pixed de (Cognitiv	IXI Procedural (Fixed, Structured)  1 Variable (Cognitive, Semi-Structured)  And	Analyst: C.	
	Factors		Inouts		Process	Outputs				<u> </u>	
:	Affecting							Time	ć		Present
Function(S)/Tasks	Performance	From	Content	ment	Actions	Content	2	minsec	Periormance Standard(s) Assessment Method	(S)D.	Assessment Method
-				BCS	Press EXEC key	Displayed Gun	5.00		EAEC key pressed prom		Compare displayed
<del>- 5</del>						Orders on BCS	i a		WHEN FIM; SUBS COLLEG		Fire Order
-				RCS	Review Gun	Determination	Sel		Gun Orders reflect Fire		Compare displayed Gun
				}	Orders for com-	that Gun Orders	FDO		Order		Orders with requested
					pleteness/accu-	are complete/				<u> </u>	Gun Orders
					racy	accurate					
				BCS	Press XMIT key	Fire commands	How		XMIT key pressed promptly; Observe polling status	mptly:/0	bserve polling status
					to transmit Fire	transmitted to	န္တ		polling status displayed	~~ •	
					Commands to	How Sec. polling				-	
					Howitzer Section Status displayed	status displayed					
R-		How	Gun ACK	BCS	Monitor gun	DATA/ACK indi-	Self		Observe ACK status on		Observe ACK indica-
_		Ş	-	) }	polling ACK	cation received	FDO		display		tion on BCS
		3			status	from How Sec	) }			_	
		How	Gun READY	BCS	Monitor gun	READY indication Self,	Self		Observe READY and FIRE	3	Observe READY and
		Şec	and SHOT		ready/firing	and FIRE SHOT	FDO		SHOT indication on BCS		FIRE SHOT indication
					status	indication re-			display	<u> </u>	on BCS
					·	ceived from How					
				200	D	Sec EM. EOCMD.	C <sub>I</sub>		Chot moscono troncmit	T	Observe SHOT mes-
				βC3,	Fress AMII Key	FM; FOCMD:			Shot message transmitted		Cose transmitted
			_	dote	EM. EOCHID.	and illessage	13 		prompting	<u>*                                     </u>	age changing the
				Marci	SHOT Message.	FO. FM. FOCMD:					
_					start Solash	SPLASH message					
					countdown	displayed; count-				-	
						down initiated					
				BCS,	Observe time of	FM;FOCMD:	FO,		XMIT pressed 10 seconds		Observe XMIT key
			-	Stop	flight 10 seconds		FDO		before impact	<u>a</u>	pressed correctly
				Watch	to impact; press						
-					XMIT key 10	FO; FM; SUBS					
					seconds pefore	message displayed					
					impact of round	with ballistic					
					to transmit FM;	computations en-					
					SPIASH messeneloriate fields	rered in appro-					
					of David Hicasage	לו ומיב ווביותי					
_	_					_	_			-	

Subsystem FDC				Pred	Prequisites: BCS Initialized	zed Ectablished	Tesk Cla	Task Classification:	h ales	2/00/64
Section Position(s)	Computer (BCS Operator)	CS Oper	ator)		DIKITAL COLL	III. ESTADIISHED	[X] Proce	dural (Pixed	X Procedural (Pixed, Structured)	1.
							( Variab	de (Cognitiv	Analyst:	C. Preusser
	Factors		Inputs		Process	Outputs				
Franchise (c) (Tooks	Affecting			Equip-	Antions	, and and	É	Time	Dorformondo Stondordie)	Present
runctions// 18845	reriormance	FO/	Audible alarm	BCS Bent	Press ALARM	Fire For Effect	Self	a municipal control	ALARM ACK and RCVD	Observe alarm and
		FIST	on; FIRE MSN	}	ACK key once	phase message			tly	
			Lamp on		and RCVD MSG	displayed				
				BCS	Review message	Message reviewed	FDO		Message content correctly	Compare announced
				) ) 	and interact with	and interact withand announced to				content with displayed
		-			FDO per SOP	FDO				message content
				BCS		Gun Orders dis-	Self,		EXEC key pressed promptly Compare displayed	Compare displayed
						played on BCS	FDO			order with requested order
				BCS	Press XMIT key	Gun Orders trans-			XMIT key pressed promptly; Observe polling	Observe polling status
					to transmit Gun	mitted to How	Sec		polling status displayed;	and FM; MTO
لفديد					Orders to How	Sec; polling sta-			FM; MTO message dis-	
					Sec	tus displayed on			played	
						BCS; FM; MTO				
						message displayed				
		How	Gun ACK	BCS	1.	DATA/ACK indi-	Self,		Observe ACK status on	Observe ACK indica-
		၁ခင္တ			polling ACK	cation received from How Sec	FDO		BCS display	tion on BCS
<del></del>				BCG	Droce XMIT how	FM. MTO mes-	FO		FM: MTO message trans-	Observe FM: FOCMD:
				3	to transmit FM:	sage transmitted	) •		mitted to FO; FM;	SHOT message dis-
					MTO message	to FO; FM;			FOCMD: SHOT message	played
					9	FOCMD: SHOT			displayed	·
		į				message displayed			_	
		How	Gun READY	BCS	Monitor gun	READY indica-	Self,		Observe READY and FIRE	Observe READY and
		မ က	and SHOT		ready/IIring	CHOR BING FIRE	20.		display	on BCS
					Status	received from			friden	
						How Sec				
				BCS,	Press XMIT key	FM; FOCMD:	FO,		Shot message transmitted	Observe SHOT mes-
				Stop	to transmit FM;	SHOT message	Self		promptly	sage transmitted
				Watch	FOCMD: SHOT	transmitted to				
					message; start	FO; FM; FOCMD:				
					down	displayed: count-				
						down initiated				
				_						
,	_	_	_	_	_		_	_		

Factors   Fact	Subsystem FDC				a de	Promisites BCS Initialized	par	i de la companya de l	Thet Classification.		5 	
Fectors	Color of the color	Computer (BC	S. Orere	tor)		Digital Com	m. Established	NI December	dune (Bired		Vision	Dete: 3/22/84
Affecting From Content Equip— Actions Content To Indipace Busing Process Content Prom Content Date of Party For Party Process Plansmitted to Stop to indipace press Process Plansmitted to Party Process Proce	Section Positionis)	Comparer	200					Variet	ble (Comitiv		- 11	
Affecting From Content Equip Actions Content To Minesec From BCS, 10 Tight 10 seconds PLASH message FDO From Match Key 10 FO; FW; SUBS Execonds before message displayed message from FIST On. FIRE FIST On. FIRE BCS Fress ALARM FW; SUBS FROM Self From FIST On. FIRE BCS Fress ALARM FW; SUBS FROM Self From FIST On. FIRE BCS Fress ALARM FW; SUBS FROM Self From From From From From From From From		Factors		Inputs		Process	Outputs				-	
BDCS. Observe time of FM; FOCMD: FO. Stop flight to seconds PC FD. FM; SUBS Seconds before message displayed impact of round with ballistic to transmit FM; computations FOCMD: SPLASH Intered in appromessage displayed message displayed for the flight ballistic to transmit FM; computations FOCMD: SPLASH FM; SUBS: END Self ACK key once message displayed and RCVD MSG Review EOM* Message reviewed Self. Review EOM* Message reviewed Self. Review EOM* Message reviewed Self. Review EOM* Message reviewed Self. Review EOM* Message reviewed Self. Review EOM* Message reviewed Self. Review EOM* Message reviewed Self. Review EOM* Message reviewed Self. Review EOM* Message reviewed FDO. Current mission Current mission Current mission Current mission and displays cleared FDO. Sec Gur ACK Displays cleared FDO. And displays cleared FDO. Sec Gur ACK Displays cleared FDO. Sec Cleared Message RDO. How Sec Cleared And Gasplays and Gaspla	   Function(s)/Tasks	Affecting	From	Content	Equip-	Actions	Content	<u>ئ</u>	Time	Performance Standar		Present Assessment Method
Watch Ingr. in Seconds Privant mesage FDD  Watch (impact; press Fransnitted to FDS)  Second March (impact; press Fransnitted to FDS)  FEST (impact of cound with ballistic of transmit FM; SUBS)  BEST (impact of cound with ballistic of transmit FM; SUBS)  MSN Lamp on Message displayed for FDD  Review EOM* Message reviewed Self, field and Review EOM* Message reviewed Self, field for FDD  Review EOM* Message reviewed Self, field for the Reviewed Self, field for the Reviewed Self, field for the Reviewed Self, field for the Rev				, , , , ,	BCS,	Observe time of		F0,		XMIT key pressed 10		serve XMIT key
with the control of t					Stop	flight 10 seconds		201		roediiii ainian eninaasi		see collectify
mess conds before message displayed impact of round with ballistic to transmit FM: computations FOCMD: SPLARH aftered in appromentation on FIRE MSN Lamp on RCVD MSG Message reviewed Self ACK key once message displayed ACK key once message displayed ACK key once message displayed ACK key once MSN Lamp on RCVD MSG Review EOM* Message reviewed Self, field BCS Review EOM* Message reviewed Self, field BCS Press EXEC key FM: SUBS mes-FSO Curent mission by the deleted. BCS Press EXEC Key FW: SUBS mes-FSO Curent mission by the deleted. EOM transmitted How the deleted. EOM transmitted FDO, and displays cleared FDO, and displays cleared FDO, and displays cleared FDO.						XMIT key 10	FO; FM; SUBS					
Impact of round with Dealistic to fransmit FM: Computations FOCMD: SPLASH Entered in appronessage Driate fields FIST on. FIRE ACK key once Message displayed RASN Lamp on RACK key once Message reviewed Self.  MSN Lamp on RACK key once Message reviewed Self.  ROUND						seconds before	message displayed					
FOCMD: SPLASH Intered in appro- message FIST on, FIRE MSN Lamp on Review EOM* Message reviewed Self.  Edit Review EOM* Message reviewed Self.  Review EOM* Message reviewed Self.  BCS Review EOM* Message reviewed Self.  FIST Review EOM* Message reviewed Self.  BCS Review EOM* Message reviewed Self.  FIST Review EOM* Message reviewed Self.  FOURTHAINSIGN Lamp on Review EOM* Message reviewed Self.  FOURTHAINSIGN Lamp on Review EOM* Message reviewed Self.  FOURTHAINSIGN Lamp on Review EOM* Literatory EOM* Literatory EOM* Literatory EOM* Literatory EOM* Literatory EOM* Literatory EOM* Literatory EOM* EOM* EOM* EOM* EOM* EOM* EOM* EOM*					_	impact of round	with ballistic		_			
FIST On. FIRE  MESSAGE FIST On. FIRE  MSN Lamp on  Rey twice  GCS  Fress EXEC Rey FM; SUBS: EOM  Rey twice  How Gun ACK  BCS  Cleared  Cleared  Sec  How Sec  Cleared  Sec  Figure Fields  Fress ALARM FW; SUBS: EOM Self FDO  Seg sont to FSO. Current mission  Updated to EOM, the How Sec  FOO  Sec  How Gun ACK  BCS  Observe ACK  Displays cleared  Self  Self  Sec  Foo  Foo  Foo  Foo  Foo  Foo  Foo  F						to transmit FM;	computations					
Press ALARM FWI SUBS: EOM Self FIST Audible alarm BCS ACK key once message displayed ACK key once message displayed ACK key once message displayed ACK key once message displayed ACK key once message displayed BCS Review EOM* Message reviewed Self, field BCS Press EXEC key FM; SUBS mes-FSO Sage sent to FSO. Current mission updated to EOM, then deleted. EOM transmitted How BCS Observe ACK Displays cleared Self cleared Sec Sec Sec Sec Sec Sec Sec Sec Sec Sec						FOCMU: SPLASH	entered in appro-		_			
FIST On. FIRE  umes  FIST On. FIRE  MSN Lamp on ACK bey once message displayed and RCVD MSG  MSN Lamp on File  BCS Review EOM* Message reviewed Self, field BCS Press EXEC key File SUBS mes- FSO Current mission updated to EOM, then deleted. EOM transmitted How to How Sec Sec How Gun ACK BCS Observe ACK Displays cleared FDO, cleared FDO, and displays cleared FDO, cleared FDO, and displays cleared FDO, cleared FDO, and displays cleared FDO, cleared FDO, and displays cleared FDO, cleared FDO.						message	priate fields	41.0		Ja Pas ADV May IV	Ì	corve Alarm and
umes  Hist on, Fire  MSN Lamp on ACR Ney Once message displayed  Review EOM* Message reviewed Self,  Field Review EOM* Message reviewed Self,  Field Review EOM* Message reviewed Self,  Field Review EOM* Message reviewed Self,  Field Review EOM* Message reviewed Self,  Field Review EOM* Message reviewed Self,  Field Review EOM* Message reviewed Self,  Field Review EOM* Message reviewed Self,  Field Message reviewed Self,  F			9	Audible alarm		Press ALARM	FIM; SUBS: EUM			MSG keys pressed pro	motty FIR	E MSN Lamp off
How Gun ACK BCS Observe ACK Displays cleared FDO.  How Gun ACK BCS Observe ACK Displays cleared FDO.  How Gun ACK BCS Observe ACK Displays cleared FDO.  Cleared BCS Review EOM* Message reviewed Self.  How Gun ACK BCS Observe ACK Displays cleared FDO.  Cleared Self.  How Gun ACK BCS Observe ACK Displays cleared FDO.	_		FIST	on. FIRE		ACK Key once	message dispinayed			inog vegs pressed pro		
How Gun ACK BCS Observe ACK Displays cleared FDO.  How Gun ACK BCS Observe ACK Displays cleared FDO.  Sec Cleared FSO.  Sec Cleared FSO.  Sec Cleared FSO.  Sec Cleared FSO.  Sec Cleared FSO.  Sec Cleared FSO.  Sec Cleared FSO.  Sec Cleared FSO.  Sec Cleared FDO.  Sec Cleared FDO.  Sec Cleared FDO.				MSN Lamp on		and KCVD MSG						
How Gun ACK BCS Observe ACK Displays cleared FDO.  Sec Cleared Cleared FDO.  How Gun ACK BCS Observe ACK Displays cleared FDO.  Sec Cleared Cleared FDO.					BCC	Roviow FOM*	Message reviewed	19				
BCS Press EXEC key FM; SUBS mes- sage sent to FSO. Sage sent to FSO. Current mission Updated to EOM, then deleted. EOM transmitted How Sec to How Sec Sec And displays Cleared FDO, Cleared Self Cleared Self	no replot desired:					field	,					
Sec How Gun ACK BCS Observe ACK Displays cleared FDO, cleared and displays cleared FDO, cleared cleared Self cleared self	covered in SM				BCS	Press EXEC key	FM; SUBS mes-	•		EXEC key pressed pro	>	serve EXEC key
Current mission Updated to EOM, then deleted. EOM transmitted How to How Sec Sec  How Gun ACK BCS Observe ACK Displays cleared FDO, and displays cleared Self	061-279-2005					•	sage sent to FSO.			and EOM message upd		essed correctly and
updated to EOM, then deleted. EOM transmitted How to How Sec Gun ACK BCS Observe ACK Displays cleared FDO, and displays cleared Self cleared Self							Current mission				OH OH	M message updated
then deleted.  EOM transmitted How to How Sec Sec Sec Sec And displays cleared FDO, and displays cleared FDO, cleared cleared Self clea							updated to EOM,					
Gun ACK BCS Observe ACK Displays cleared FDO, and displays cleared FDO, cleared cleared Self												
Gun ACK BCS Observe ACK Displays cleared FDO, and displays cleared Self cleared cleared								How				
and displays cleared cleared cleared				A A Cut	BCC	Observe ACK	T	FDO		ACK message received	d and Ob	serve guns ACK and
			Sec Sec	Wat III		and displays	o para sefendera	Self		displays cleared	dis	plays cleared
						cieared						

a a <u>.                                  </u>	Subsystem EDC	Computer (BCS Operator)	Jeg Sol		Prequi	Prequisites: BCS Initialized Digital Comm.	ed Fetablished	Task Clay	Task Classification:	Revision	3/21/84
K [				1-4-4		,					
	Section routions/		NA ANA	aror)				(X) Proce	dural (Pixed de (Cognitiv	IXI Procedural (Fixed, Structured)  [ ] Variable (Cognitive, Semi-Structured) Analyst:	C. Preusser
-		Factors		Inputs		Process	Outputs				
_	Function(s)/Tasks	Affecting Performance	Fom	Content	Equip- ment	Actions	Content	To	Time (minsec)	Performance Standard(s)	Present Assessment Method
<u> </u>	Determine Firing Data TACPIRE (Area Mission)		μ==	MSN	BCS	Observe alarm and FIRE MSN Lamp on BCS	Initiation of task Self	Self	00:00	Message alarm and FIRE MSN Lamp observed	Observe performance
, wie c	SM Task # & Name 061-279-2002 061-279-2003				BCS	Press ALARM ACK key once and RCVD MSG key twice	FM; FC; PRI message displayed	Self		ALARM ACK key and RCVD MSG key are pressed promptly	Observe Alarm off and message displayed
	061-279-2004 Determine Firing	·			BCS	Review message in accordance with SOP and	Message reviewed; Sell FM; FC; PRI re- flects fire order;	Self		FM; FC; PRI content correct; EXEC key pressed promptly	Compare fire order content with displayed FM; FC; PRI
B-57	Data for TACFIRE for a Target Located by Grid Coordinates, Polar					press EXEC key	gun orders auto- matically com- puted and dis- played on BCS				
	Plot, and Shift				BCS	Press XMIT key to transmit gun	-SI	How Sec		XMIT key pressed prompt- ly; polling status displayed	Observe polling status
	Point (Area Mission)					orders to How Sec	Sec; polling sta- tus displayed on BCS				
	TRI: 74		TAC- FIRE	FM; MTO, FM; FOCMD:	BCS	Press NEXT SEG Related key three times reviewed	messages			NEXT SEG key pressed promptly; messages	Observe related messages
	References/Notes TM11-7440-283- 12-1-1 (Chapter			SHOT and FM; FOCMD: SPLASH mes-sages*				Self		reviewed	
	3, Pg. 28) [Advance Copy] *Note: Messages		TAC- FIRE	Audible alarm on. FIRE MSN Lamp on	BCS	Press ALARM ACK key once and RCVD MSG key twice	FM; FC; PRI message dis- played	Self		ALARM ACK and RCVD MSG kcys pressed promptly	
	transmitted automatically through TACFIRE to FO/FIST				BCS	Review message in accordance with SOP and press EXEC key	Message reviewed; FM; FC; PRI message reflects fire order; gun orders automatically computed and displayed on BCS	Self		FM; FC; PRI content correct; EXEC key pressed promptly	Compare fire order content with displayed FM; FC; PRI
			·····								

Prequisites: BCS Initialized

	Designation of the second	Computer (BCS (Decrator)	S. Orere	tor)		Digital Comm. Established	1. Established	Task Class	Task Classification:	Revision	n Date: 3/21/84	1
Dec. Inc.								Variab	te (Cognitiv	Ly frocesses (rises, Structures)  [ ] Variable (Cognitive, Semi-Structured)  Analyst:	C. Preusser	1
		Factors		Inouts		Process	Outputs					Γ
Funct	Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	<b>9</b>	Time (minsec)	Performance Standard(s)	Present Assessment Method	P
					BCS	Press XMIT key	trans-	표		XMIT key pressed promptly Observe polling status	ly Observe polling statu	S
						to transmit gun	mitted to How	Sec		polling status displayed	-	
						orders to How	Sec; polling sta-					
						Sec	tus displayed on BCS					
			TAC-	t	BCS	Press NEXT SEG	Press NEXT SEG Related messages			NEXT SEG key pressed	Observe related mes-	
<del></del>			FIRE	FM; FOCMD: SHOT and FM; FOCMD: SPLASH mes-		key three times reviewed	reviewed	FIST, Self		promptly; messages reviewed	Sagges	
-Note:	*Note: Messages			alarm	BCS	Press ALARM	FM; FC; PRI	<u>.</u>		ALARM ACK and RCVD	Observe alarm off and	2
_	transmitted auto-		FIRE	on. FIRE MSN		ACK key once	message displayed		MSG K	MSG Meys pressed promptly	message displayed	
TACE	matically through TACFIRE to FO/			Lamp on		and KCVD MSG key twice						
FIST					BCS	Review message	Message re-	Self		FM; FC; PRI content cor-	┪	
						in accordance	viewed; FM; FC;			rect; EXEC key pressed	content with displayed	고
						with SOP and	PRI message re-			promptly	FM; FC; PRI	
_						press EXEC key	flects fire order;					
							gun orders auto-					
-							matically com-					
							puted and dis-					
					BCS	Press XMIT key	Gun orders trans-	How		XMIT key pressed prompt-	1- Observe polling status	Sī
						to transmit gun	mitted to How	Sec		ly; polling status displayed		
						orders to How	Sec; polling sta-					
						Sec	tus displayed on BCS					
			TAC-	FM; MTO,	BCS	Press NEXT SEG	Press NEXT SEG Related messages			NEXT SEG key pressed	Observe related mes-	,
			FIRE	FM; FOCMD:		key three times reviewed	reviewed	FIST,		promptly; messages re-	sages	
				SHOT and				<u>.</u>		viewed		
				SPI ASH mes-								
				Sages*								
											-	_

Subsystem FDC				ď	BCS Initialized				Page	ا ا
neit tonds)	Computer (BCS Operator)	S Operat	(or)		Digital Comr	n. Established	P. Brose	ILSK CIESSINGERION: ht Department (Bixed	Revision	Date: 3/21/84
	70 F						( ) Variat	de (Cognitiv	K. Procedural (Fried, Semi-Structured)  [   Variable (Cognitive, Semi-Structured) Analyst:	C. Preusser
	Factors		Inputs		Process	Outputs				
   Function(s)/Tacks	Affecting	802	Content	Equip-	Actions	Content	ع	Time	Performance Standard(s)	Present Assessment Method
	5	TAC-	Audible alarm	BCS	Press ALARM	Fire For Effect	Self		ALARM ACK and RCVD	Observe alarm off and
		FIRE	on. FIRE MSN		ACK key once	Phase message			MSG keys pressed promptly message displayed	y message displayed
			Lamp on		and RCVD MSG key twice	displayed				
				BCS	C key	Gun orders dis-	Self		EXEC key pressed promptly Observe gun orders	ly Observe gun orders
						played on BCS				_
				BCS	Press XMIT key	-su	How		XMIT key pressed prompt-	Observe polling status
					orders to How	Mitted to now Sec: polling sta-	o acc		iy, poiiiiig status dispiayet	
						tus displayed on BCS				
•Note: Messages		TAC-	FM; MTO,	BCS	Press NEXT SEG	Press NEXT SEG Related messages			NEXT SEG key pressed	Observe related mes-
transmitted auto-		FIRE	FM; FOCMD:		key three times	reviewed	FIST,		promptly; messages	sages
matically through			SHOT and FM: FOCMD:				Self		reviewed	
FIST			SPLASH mes-							
		TAC-	Audible alarm	BCS	Press ALARM	FM; EOM mes-	Self		ALARM ACK and RCVD	Observe FM; EOM
		FIRE	on. FIRE MSN Lamp on		ACK key once and RCVD MSG key twice	sage displayed			MSG keys pressed promptly message	y message
<del></del>				BCS	essage	Message re-	Self		Message reviewed promptly	
**This flow as-				BCS	Press EXEC key	FM; EOM mes-	How		EXEC pressed promptly;	Observe display
sumes no Replot desired (See task						sage transmitted to How Sec; dis-	Sec,		display cleared	cleared
061-279-2005)						play updated; display cleared**				
				-						

							Devende		Dame 1	
Subsystem FDC			Prequ	Proquisites: BCS Initialized	paz	Task Clea	Task Classification:			
Section Position(s)	Computer (BCS Operator)	Operator)		mo milian	DELLA COMM. ESTABLISHED	IXI Proce	dural (Pixed	IX Procedural (Fixed, Structured)	Applies :	Drougger
							מב וכפשווווו		11	
	Factors	Inputs	_	Process	Outputs		į			
Function(s)/Tasks	Affecting Fr	From Content	Equip- ment	Actions	Content		Time (minsec)	Performance Standard(s)	rd(s)	Assessment Method
Determine Replot	-	EO	BCS	Display related	FM; SUBS mes-	Self	00:00	FM; SUBS/EOM: RAT mes-	_	Observe FM; SUBS/
Data	environmen- FIST	r message		теѕѕаве	sage with EOM:			sage properly displayed		EOM: RAT message
SM Task # & Name 2b) Noise	tal 2b) Noise			_	KAT message displayed				<u> </u>	displayed on BCS
061-279-2005	equipment	-	Area	Plot target co-	Target altitude	Self		Target coordinates cor-		Observe target coordi-
	7) High		Map,	ordinates on	(in meters) deter-			rectly plotted on area	я тар	rectly plotted on area map nates correctly plotted
	communica-		Plot-	area map	mined				_	
Keplot Targets	tion load		ting							
(HE: Q. TI. VT)	equipment		ment							
•	and/or		BCS	Enter "X" in	REP: field and	Self		REP: and ALT: fields con-	•	Observe target coordi-
TRI: 40	clothing		·,	REP: field and	ALT: field con-			tain correct target coor-		nates correctly
	10) Opera-			target altitude				dinates	<u> </u>	entered in REP: and
References/Notes	tional state			(meters) in ALT:	coordinates					ALT: fields
			BCS	FXFC LAN	Roleted message	19		FXFC key pressed		Observe recommitted
-007-0151 11 1011 1			2	LICES TUTO NES	dienlated message	5		competition moderate dis	10000	ouse ve recompared
2 De 1413					displayed with			with moon mit of towns and the moon distant	played i	anget coordinates
5, Fig. 141)					new target coor-			with recomputed target		message dispidyed
LAUVAINCE COPYJ					cally recommitted			coordinates		
			Area	Plot new target	New target alti-	Self		New target coordinates	T	Observe new target
			Map.	coordinates on	tude (in meters)			correctly plotted on area		coordinates correctly
			Plot-	агеа тар	is determined			тар		plotted
-			ting							
			Equip-							
			BCS	Compare target	Target altitude	3		Target altitude comparison		Observe target altitude
			)	altitude com-	comparison is			correctly made to within		comparison correctly
				puted in #2.	within one-half			one-half of a contour		made
				above, with tar-	of a contour			interval		
				get altitude	interval					
				computed in #5.						
	_			above. Repeat						
				process until						
				comparison is			•			
				within one-half						
-				contour interval						
					_					
									-	
_							•			
_	_	_	_				_		_	

					BCC Initialization	to.				Page 2 of 2 Pages
	Computer (RCS Operator)	Oper	ator)	Prequ	Prequisites: Digital Comm. Established	m. Established	Thisk Clas	That Classification:		Revision 0 Date: 3/22/84
Section rostions)	a land						EXJ Proces	berel (Pixed) le (Cognitiv	IX Procedural (Fixed, Structured) [ ] Variable (Cognitive, Semi-Structured) Analyst:_	C. Preusser
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	2	Time (minsec)	Performance Standard(s)	Present Assessment Method
				BCS	Enter "X" in EOM: field and Tor K in RAT:	EOM: field and RAT: field con- tain target data			EOM: and RAT: fields contain correct target data	Q ₹ S
				BCS	Press EXEC key		How Sec		EXEC key pressed promptly; displays deleted	Observe EXEC key the pressed and displays deleted
						FM; SUBS message transmitted	FO/ FIST			
						to FU/FIST. Displays deleted. Mission entered in file	Self			

Task Classification: [X] Procedural (Pixed, Structured) [ ] Variable (Cognitive, Semi-Structured) Proquestes: BCS Initialized
Digital Comm. Established
Order to Conduct Prec. Reg SR FD Sp (Computer, BCS Operator) FDC Section Position(s)

Date: 12/15/83 Hamilton

	Factors		nouts		Process	Outputs				
				Equip-				Time		Present
Function(s)/Tasks	اره	From	Content	ment	Actions	Content		minsect	Performance Standard(s)	Assessment Method
Determine Piring			Msg Alarm	BCS		Initiation of	Jig S	00:00	Msg Alarm observed	None, until acknowl-
Deta	ن	(FIST)	lighted and		S	task	(dwo:))			edged
SM Task # & Name operation	operation		audible	BCS		Displayed PTM	is Sel		Alarm Ack key and Revd	Observe Alarm Off
061-279-2011	7) High com-				Ack once and	stating direction	(Comp)		Msg keys are pressed	and Message Displayed.
Determine Firing	lond and	_		Danor	┰	Announcement of	2003		Message content correctly	Compare announced
Data for Specific	q) Perconal			Poncil		direction	. FS		repeated	message content with
Shell-Fuze Combi-							S			display of message
nations using BCS	_				direction		FD So			content
(Comp)	_	FDO	Announcement	BCS	Display FM;	Announcement	FD.		Message content correctly	Compare announced
•	gloves and		to process			of known point	Ch FD		repeated	message content with
TRI: 74	mask		registration		file	contents (coor-	Sp.			display of message
<u> </u>	10) Opera-		mission		_	dinates, etc.)	FD Sp,			content
References/Notes	tional state-				contents		Seif			
	target load						(Comp)			
TM11-7440-283-	F	FDO	Issued Fire	BCS	Edit/enter direc-	Displayed FM; RFAF message	Self		FM; RFAF message fields	Compare displayed
131/06/6 -0 6			3			in the message	2		dence with the Order	Control of the first
3, Fg. 3-39)	•					In accordance	- C		dance with rife Order	message with requested
					-159	With rire Order	בי היי			rire Order
			-		Order		<u>8</u>			
				BCS	W message	BCS displays	FSO.		EXEC is pressed when	Compare displayed Gun
					_	Gun Orders	FDO		desired FM. RFAF is cor-	Orders with Fire Order
					_	Mission dis-	G 5		reat	Observe desired
						Sign in Dischar	) 		ובכו	Cosei ve desired
						piayed in iscs	do Jes			Weapon, Snell-Tuze
						current mission	1 (5)			combinations. Fin.
						me. FM; KFAF	(dwo)			KrAr message re-
				BCS	Review Gun	Determination	Self		Gun Orders reflect FDO's	Compare displayed
					-mo	that Gun Orders	(Comp)		Fire Order	Gun Orders to Fire
					pleteness/accu-	are complete/	FDO,			Order Request
	_				racy	accurate	Ch FD			
							Sp			
										(continued)
									-	
										-
_	_	_			_		_	_		_

Subsystem					BCS Initialized	þ	í	:	Page 2	Page $\frac{2}{2}$ of $\frac{2}{2}$ Pages
(9)	SP ED Sp (Committee BCC Operator)	D. B.	C. Operator		Digital Comm	Digital Comm. Established	Task Classification:	STICETION:	Revision	1 Date: 12/15/83
1	most of the u	d Taind	מאפומלה פי		Order to Con	Order to Conduct Prec Reg	Variable	e (Cognitiv	I veriable (Cognitive, Semi-Structured) Analyst:	J. Hamilton
	Factors		Inouts		Process	Outputs				
Function(s)/Tasks	Affecting	From	Content	Equip- ment	Actions	Content	2	Time (minsec)	Performance Standard(s)	Present Assessment Method
				BCS	Press XMIT	Gun Orders	Γ		Gun Orders transmitted	Observation of BCS
					to transmit Gun	transmitted.	FDO, Ch FD		promptly without error	polling status and displayed FM: MTO
		_		. <u></u>		tus and FM;				
						MTO displayed on BCS	(Comp)			
				BCS		FM; MTO trans-	F0,		FM; MTO transmitted	Observation of pro-
					MTO and press	mitted.	FDO,		promptly in accordance	cedural task steps per-
					mit FM: MTO	Gun polling sta- tus displayed	S. S.		with Fire Request	tor. ACK received
D					when polling sta-on BCS	on BCS	Self			from FO
6					tus sirons acaus		1			
								_		
-										
										·
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-								_		
· <del></del>										
_	_			_			_	_		

Subsystem FDC				9	BCS Initialized	ed		•			
	,	,			Digital Comm. Established	n. Established	Task Class	Task Classification:		Revision	Bevision 0 Date: 3/22/84
Section Position(s)	Computer (BCS Operator)	SOper	ator)				KJ Proced	lural (Pixed	() Procedural (Pixed, Structured)	ľ	
							Verieb	le (Cogniti	[ ] Variable (Cognitive, Semi-Structured)	Analyst	Analyst: C. Preusser
	Factors		Inputs		Process	Outputs					
	Affecting			Equip-				Time			Present
Function(s)/Tasks   Performance   From	Performance	From	Content	ment	Actions	Content	To	(minsec)	To (minsec) Performance Standard(s)	dard(s)	Assessment Method
Coordinate Bat- 2a) Noise	2a) Noise	FAC-	12	BCS	Observe alarm	Initiation of task Self	Self		Message alarm and	FIRE	Message alarm and FIRE Observe performance
tery in Battalion	L	FIRE	on. FIRE MSN		and FIRE MSN			-	MSN Lamp observed	P	
Mass Fire	tal		Lamp on		Lamp on BCS						
	2b) Noise			BCS	Press ALARM	Press ALARM NNFP; FC mes- Self	Self		ALAR ACK and	RCVD	ALAR. ACK and RCVD Observe alarm off and
								_	~ ~ ~ ~		CONTRACT OF STREET

	Factors		Inputs		Process	Outputs				6	_
Function(s)/Tasks	Affecting	From	Content	Equip-	Actions	Content	Ę	Time	Performance Standard(s)	Present Assessment Method	
Countinote Det.	20) Noice	1011	1	200	٤	Initiation of task Self	210%	1	Т	Observe performance	_
tery in Battalion	environmen-	IAC- FIRE									
	2h) Noise			BCS		NNFP; FC mes-	Self		-	Observe alarm off and	
	equipment				٥, ٥	sage displayed			MSG keys pressed prompt-	NNFP; FC message displayed	
	() High communica-				key twice				displayed		
	load			BCS	ssage		Self		NNFP; FC content correct; Compare fire order	Compare fire order	
SM Task # & Name 9) Personal	9) Personal					viewed; NNFP;			EXEC key pressed promptly content with displayed	content with displayed	
061-279-2016 equipment	equipment			•		FC reflects fire				NNFP; FC	
					press EXEC key	order; gun orders					_
Determine/Process	-					automatically					_
				•		computed and					
TACFIRE-Specified tional state	tional state			_		displayed on BCS	_				
Time-On-Target									7		_
Fire Mission				BCS		JS-	How			Observe messages	_
					_		Sec			displayed on BCS	_
TRI: 74						Sec; time-to-fire			played; FM; MTO message		_
.1						countdown clock			displayed		_
References/Notes			-			displayed; FM;					
T. 14 11 -7440-909-						MTO message		_			
12-1-1 (Chapter			1	BCS	Press LIRE key	ire	How		FIRE key pressed	Observe FIRE key	
3, Pg. 34)					_	stored in BCS	Şec		promptly	pressed promptly	
[Advance Copy]						until countdown					
				-		clock reaches					_
						000; at 000 com-					_
	_					mand automati-					
						cally transmitted to How Sec					
		TAC-	FM: M J.	BCS	Press ALARM	es-	Self		ALARM ACK and RCVD	Observe alarm and	
*Note: Messages		FIRE	FM; FOCMD:		_	sage displayed*			keys pressed promptly;	FIRE MSN Lamp off	_
transmitted auto-			SHOT and		and RCVD MSG				FM; EOM message dis-	and FM; EOM message	_
matically through			FM; FOCMD:	-	key twice				played	displayed on BCS	
ACFIRE to			SPLASH mes-					_			_
FO/FIST			sages.*								_
			Audible alarm	·							_
			MSN Lemb on								
			no dillipo violi								_
					•						_
		_	_	_	_		_	_	_		_

Subsystem	FDC				Person	BCS Initialized	pa	1			7 10 7 200
Section Position(s)		Computer (BCS Operator)	S Operat	Or)		Digital Com	m. Established	IN Proces	Silication:		Revision 0 Date: 3/22/84
								( ) Veriab	le (Cognitiv	[ ] Variable (Cognitive, Semi-Structured) Analyst:	C. Preusser
		Factors		Inputs		Process	Outputs				
Function	Function(s)/Tasks	Affecting	From	Content		Actions	Content	To	Time (minsect	Performance Standard(s)	Present Assessment Method
					BCS	Review message	FM; EOM mes-	How		Message reviewed and	Observe message:
*This flow	low					in accordance with SOP and press EXEC key	sage reviewed and transmitted to How Sec; dis- play updated; display cleared**	Sec. Self.		EXEC key pressed prompt- lobserve display ly; display cleared	cleared
assumes no Re (see Task 061- 279-2015)	assumes no Replot (see Task 061- 279-2015)										
B-65											
			_								
<del></del>					_						
<del></del>						,					

Assessment Method Observe elapsed time Observe performance Observe updated file status displayed on BCS. Observe alarm off and message displayed Revision 0 Date: 3/23/84 of 1 Pages C. Preusser Page 1 EXEC key pressed promptly; lower display clear; file status displayed Analyst: Performance Standard(s) Message alarm and FIRE MSN lamp observed ALARM ACK and RCVD MSG keys pressed promptly [ ] Procedural (Pixed, Structured)
[ ] Variable (Cognitive, Semi-Structured) 00:00 Task Classification: Time BCS Self Self Se. Initiation of task FM; QF message entered in known point file; lower display cleared; file status upnumber assigned Digital Comm. Established Outputs Known point Content to target; dated and displayed displayed BCS Initialized key twice Press EXEC key ACK key once and RCVD MSG Observe alarm and FIRE MSN lamp on Press ALARM Actions Process Prequisites: — Equip-ment BCS BCS BCS Audible alarm on FIRE MSN lamp on Content monts Computer (BCS Operator) FO/ FIST Factors Affecting Performance 2a) Noise environmencommunica-tion load ional state 2b) Noise equipment 9) Personal 10) Operaequipment clothing 7) High and/or E Process/Determine
Data for a Quick
Fire Mission TM-11-7440-283-12-1-1 (Chapter 3, Pg. 82) SM Task # & Name 061-279-2017 FDC Function(s)/Tasks Control/Coordinate FPE Mission References/Notes [Advance copy] Section Position(s) TRI: 74 Subsystem

Task Classification: Propulates: BCS Initialized Digital Comm. Established Computer (BCS Operator)

		ı					(X) Variab	de (Cognitiv	(10 Variable (Cognitive, Semi-Structured) Analyst:	Analyst: C. Preusser
	Factors		Inouts		Process	Outputs				
Function(s)/Tacks	Affecting	E C	Content	Equip-	Actions	Content	- E	Time	Performance Standard(s)	Assessment Method
Determine Firing	_	F0/	Audible Alarm	BCS	Observe Alarm	Initiation of task Self	Self	00:00	Message Alarm and FIRE	Observe performance
Data	environmen-	FIST	on FIRE MSN		and FIRE MSN				MSN lamp observed	
SM Task # & Name			lamp on		lamp on BCS;					
061-279-2300	2b) Noise				observe input					
	equipment 7) High				queue increased by 2					
Determine Firing	communica-			BCS	ALARM	Audible alarm	Self		ALARM ACK key pressed	Observe alarm off
Data for Shell	tion load				ce	off			promptly	
Illumination—	9) Personal			BCS	Press RCVD	INPUT QUEUE	Self		RCVD MSG key pressed	Observe INPUT
Coordinated (BCS)	equipment				MSG key once	data displayed			promptly	QUEUE data
	and/or					indicating two				
1KI: 74	Clothing 10) Opera-					sages received				
References/Notes	tional state			BCS	Press number	HE portion of	Self		Number "1" key and EXEC	
						first FM;RFAF			key pressed promptly	(HE Portion)
. TM11-7440-283-					EXEC key	in input queue				displayed on BCS
12-1-1 (Chapter					•	displayed	į			
3. Pg. 88)				BCS	Review message	Message re-	F0/		EXEC key pressed	Observe gun orders
(Advance Copy)					in accordance	viewed; FM;	FIST,		promptly, gun orders dis-	displayed on BCS
					with SOP and	RFAF transmitted	BCS,		played	
					press EXEC key	to FO/FIST, gun	Self			
						orders automati-				
						cally computed				
						and displayed;				
						mission placed in				
						current mission				
				BCS	Press XMIT key	Gun orders trans-	How.		XMIT key pressed	Observe polling status
						mitted to How	Sec		promptly; polling status	and FM;MTO displayed
-						Sec; polling sta-	Self		and FM;MTO displayed	
						tus displayed;				
						FM;MTO dis-				
						tion)	•			
	-									
							-			
-	_ _		_	_			_	_		_

Time Time Performance Stand (Cognitive, Semi-Structured)  To (minsec) Performance Stand XMIT key pressed p FRIST, Self Sage displayed and EXEC keys prespromptly; Self BCS, promptly; gun order non Self played promptly; gun order promptly; gun order non Self played promptly; gun order promptly; polling stand FRI, MTO displayed and FM; MTO displayed promptly; polling stand FM; MTO displayed promptly; polling	Subsystem r.D.C.				Prequ	Proquisites: Digital Comm.	BCS Initialized  Digital Comm Established	Task Class	Task Classification:	Pavision	Bevision   Date: 3/93/84	
Fretors Affecting Form Content Fig. 1 Time Performance Standards)  Free Grant Form Content Form Content Fig. 1 Time Form Content Form Content Fig. 1 Fig. Form Content Fig. 1 Fig. Form Form How. Sec.; Self Fig. Form Form How. Sec.; Self Fig. Form Form How. Sec.; Self Fig. Form Form How. Sec.; Self Fig. Form Form How. Sec.; Self Fig. Form Form How. Sec.; Self Fig. Form Form How. Sec.; Self Fig. Form Form How. Sec.; Self Fig. Form Form Fig. Form Form Form How. Sec.; Self Fig. Form Form Fig. Form Form Fig. Fig. Fig. Fig. Fig. Fig. Fig. Fig.		mputer (BCS	Operato	(L)		THE COLUMN	Dalie Tonical III	l i Proced	hral (Pixed			
Performance From Content   Process   Content   Time   Performance Standard(s)   Performance From Actions   Content   Time   Performance From Actions   Process XMIT key DATA/AKV find   Prof.								(X) Verieb	le (Cognitiv			
Affecting From Gottent Form How. Sec.; Self Friedrance Standard(s)  Bec. Gun ACKU BCS Press XMIT key DATA/ACK indi- FD/, Guninee Standard(s)  Sec. Gun ACKU BCS Press XMIT key DATA/ACK indi- FD/, Guninee Standard(s)  Friedrance From How. Sec.; Self Friedrance Standard(s)  Friedrance From How. Sec.; Self Friedrance Standard(s)  Friedrance From How. Sec.; Self Friedrance Standard(s)  Friedrance F		Factors		Inputs		Process	Outputs					
How. Gun ACK <sup>(1)</sup> BCS Press XMIT key DATAAACK indi- FO/ Sec. from How. Sec.; Self Sec. from How. Sec.; Self Sec. from How. Sec.; Self Sec. from How. Sec.; Self Sec. from How. Sec.; Self Sec. from How. Sec.; Self Sec. from How. Sec.; Self Sec. from How. Sec.; Self Sec. from How. Sec.; Self Sec. from How. Sec.; Self Sec. from How. Sec.; Self Sec. from How. Sec. from How. Sec. from How. Sec. from How. Sec. from How. Sec. from How. Sec. from How. Sec. from How. Sec. from How. Sec. from How. Sec. from How. Sec. from Fig. For How. How. Sec. from Fig. For How. How. Sec. from Fig. For How. MIT displayed from How. Sec. from Fig. For How. MIT displayed from How. Sec. from Fig. For How. MIT displayed from Fig. Fig. How. from How. MIT displayed from Fig. Fig. How. from Fig. Fig. How. from Fig. Fig. How. from Fig. Fig. How. from Fig. Fig. How. from Fig. Fig. How. from Fig. Fig. How. from Fig. Fig. How. from Fig. Fig. How. from Fig. Fig. How. from Fig. Fig. How. from Fig. Fig. How. from Fig. Fig. How. from Fig. Fig. How. from Fig. Fig. Fig. Fig. Fig. Fig. Fig. Fig.	tion(s)/Tasks	Affecting Performance		Content	Equip- ment	Actions	Content		Time (minsec)	Performance Standard(s)	Present Assessment Method	
Sec. from How. Sec.; Self reage displayed from How. Sec.; Self reage displayed mitted to FOV FIST; FM: FOVOM DISPLANT MESSAGE displayed displayed displayed monitor polling status HE Portion)  BCS Press RCVD HIbrarianton portion and EXEC key input queue displayed and EXEC key input queue disproperly: Rey FM: RAF in accordance Pix RAF in accordance Pix RAF in accordance Pix RAF in a puted and displayed matically committed to FSO; Self played matically committed and displayed matically committed and displayed matically committed and displayed mission fladed in current mination Portion)  BCS Press XMIT key Gun orders trans. How. promptly; polling status sec.; polling status and FM: MTO displayed (Illumination Portion)  BCS Press XMIT key Gun orders trans. How. promptly; polling status and FM: MTO displayed (Illumination Portion)  BCS Press XMIT key Gun orders trans. How. promptly; polling status and FM: MTO displayed (Illumination Portion)			-	Gun ACK(I)	BCS	Press XMIT key	DATA/ACK indi-			XMIT key pressed promptly	Doserve FM; FOCMD:	_
Fig. 1 Price of the seguration	en ACK re-		Sec.				cation received	FIST,		FM; FOCMD:READY mes-	READY message dis-	_
mitted to FO/F FIST: FM; FOCOMDEADY  message displayed; monitor polling status  HES RCVD  MSC key once, tion of second number "I" key FM; RRAF in and EXEC key pressed  mumber "I" key FM; RRAF in and EXEC key pressed  mumber "I" key FM; RRAF in and EXEC key pressed  mumber "I" key FM; RRAF in and EXEC key pressed  mumber "I" key FM; RRAF in and EXEC key pressed  must gun order seato- played  mitted to FO; Self promptly; gun orders displayed; mission plated and displayed; mission plated and displayed; mission plated and displayed; mission plated of now foren trains  mission file (Illumina- mission file (Illumina- played (Illumina- playe	display						red mow. sec.,	1120		sake dispinated	Oberto Cun ACK	
FIST, FM; FOCMD:READY RESSER G. BECS REVER B	d FM;RFAF						rin; MIO trans-				indication on display	_
PCCMD: REDY  message displayed; monitor  polling status  (HE Portion)  BCS Press RCVD Illumination por- Self and EXEC keys pressed number "I" key FM: RFAF in and EXEC key imput queue displayed; monitor promptly monitor played; monitor and EXEC key pressed number "I" key FM: RFAF trans- BCS, promptly; gun orders displayed; mission mitted to FOS; Self played puted and displayed; mission plated in current mission in puted in current mission in played; mission mitted to How. Sec., promptly; polling status sec. Press XMIT key Gun orders trans- How. TWIT key pressed mitted to How. Sec., promptly; polling status sec. Press XMIT key Gun orders trans- How. TWIT key pressed mitted to How. Sec., promptly; polling status played (Illumina- tion Portion)  BCS Press XMIT key Gun orders trans- How. TWIT key pressed mitted to How. Sec., promptly; polling status played (Illumina- tion Portion)	to receiving						בוכת נס בס/				forders in instrumental	_
message dispoling status (HE Dortion) Press RCVD Illumination porpoling status (HE Dortion) MSG key once, tion of second number "1" key FRAF in and EXEC key input queue displayed; mission played message reviewed; FSO, promptly; gun orders displayed; mission played; mission placed in current mination Portion) Press XMIT key Gun orders trans- mination Portion) Press RCVD MSG, number "1" and EXEC keys pressed promptly; gun orders displayed; mission placed in current mission placed in current mission placed to How. Sec., promptly; polling status sec.; polling status FM; MTO displayed; tus	READY						FIST FM;					
played; monitor polling status  Press RCVD  MSG key once, tion of second number "I" key pressed in accordance PR; RFAF transpress EXEC key gun orders autopress EXEC key gun orders transplaced in current mission file (Illumination Portion)  Press XMIT key Gun orders transplayed; played; mission file (Illumination Portion)  Press XMIT key Gun orders transplayed; played; mission file (Illumination Portion)  EXMIT key pressed promptly; polling status sec.; polling status sec.; polling status played (Illumination Portion)							Comp. His					_
polling status (HE Portion) Press RCVD Illumination por- Self MSG, number "I" MSG key once, tion of second number "I" key FM; RFAF in and EXEC key pressed played input queue displayed in accordance FM; RFAF trans- BCS, promptly; gun orders displayed in accordance mitted to FSO; perss EXEC key gun orders auto- matically computed and displayed; mission file (Illumination Portion)  Press XMIT key Gun orders trans- How. Sec., polling status sec.; polling status played (Illumina- tion Portion)  Played (Illumina- tion Portion)  Press XMIT key Gun orders trans- How. Sec., promptly; polling status played (Illumina- tion Portion)							message dis-		•			
Press RCVD MIlumination por- Self RCVD MSG, number "1" and EXEC keys pressed number "1" key FM; RFAF in and EXEC key pressed promptly mumber "1" key FM; RFAF in and EXEC key pressed in accordance FM; RFAF trans- BCS, played matically compress EXEC key gun orders autonatically complayed; matically complayed; mission file (Illumination Portion)  Press XMIT key Gun orders trans- How. Sec., polling starts displayed; tus displa							played; monitor					_
Press RCVD Illumination por- MSG key once, tion of second number "1" key FM; RFAF in and EXEC key pressed number "1" key FM; RFAF in and EXEC key pressed number "1" key FM; RFAF in and EXEC key pressed number "1" key pressed numb							polling status					_
Press RCVD  Illumination por- MSG key once, tion of second number "I" key FM; RFAF in and EXEC key pressed number "I" key FM; RFAF in and EXEC key pressed played Review message reviewed; FSO, played In accordance with SOP and mitted to FSO; press EXEC key gun orders auto- puted and dis- played; mission placed in current mission file (Illu- mination Portion)  Press XMIT key Gun orders trans- played (Illumina- tion Portion)  MSGC, promptly promptly promptly promptly promptly promptly promptly promptly promptly; gun orders dis- played promptly; gun orders dis- played promptly							(HE Portion)	,		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4444	_
mumber "1" key present mumber "1" key present mumber "1" key present mumber "1" key present mumber "1" key present played message reviewed; FSO, promptly; gun orders disputed to FSO; promptly; gun orders disputed and disputed and disputed and disputed and disputed and disputed and disputed and disputed and disputed and disputed and disputed and disputed and disputed in current mission file (Illumination Portion)  Press XMIT key Gun orders trans—How. Sec., promptly; polling status sec; polling sta—Self tus displayed; fM; MTO displayed tion Portion)					BCS	Press RCVD	Illumination por-	Seli		RCVD MSG, number "I"	(illimination portion)	_
and EXEC key input queue displayed played in accordance mitted to FSO; Belf played message reviewed; FSO, Belf played mitted to FSO; Belf played matically computed and disputed and displayed; mission file (Illumination Portion)  Press XMIT key Gun orders trans—How. Sec., played mitted to How. Sec., promptly; polling status displayed; two displayed; two displayed; two displayed; file (Illumination Portion)  Press XMIT key Gun orders trans—How. Sec., promptly; polling status and FM; MTO displayed two displayed (Illumination Portion)						MSG key once,	tion of second			and EAEC keys pressed	וויחוווושרוסוו לסנירוסוו)	
and EXEC key input queue displayed  Review message Message reviewed; FSO, in accordance FM; RFAF trans- BCS, promptly; gun orders autopress EXEC key gun orders autopress EXEC key gun orders autopred and displayed; mission placed in current mission file (Illumination Portion)  Press XMIT key Gun orders trans- How. Sec., polling status and FM; MTO displayed; tus displayed; filon Portion)						number "1" key	FM; RFAF in			promptly	message displayed on	
Review message Message reviewed; FSO, promptly; gun orders dis- in accordance FM; RFAF trans- with SOP and mitted to FSO; Self played press EXEC key gun orders auto- mated by com- puted and dis- played; mission placed in current mission file (Illu- mination Portion)  Press XMIT key Gun orders trans- mitted to How. Sec., promptly; polling status and FM; MTO displayed (Illumina- tion Portion)					_	and EXEC key	input queue dis-				BCS	
Review message Message reviewed; FSO, in accordance FM; RFAF trans- BCS, promptly; gun orders displayed and displayed; mission placed in current mission file (Illumination Portion)  Press XMIT key Gun orders trans- How. Sec., played status and FM; MTO displayed (Illumination Portion)  Press XMIT key MID displayed; tus displayed; film in Portion)							played					
in accordance  FM; RFAF trans-  with SOP and  mitted to FSO;  press EXEC key gun orders auto- matically com- puted and diss- played; mission placed in current mission file (Illu- mination Portion)  Press XMIT key Gun orders trans- tus displayed;  tus displayed;  tus displayed (Illumina- tion Portion)  promptly; gun orders dis- played gun orders dis- played and ofis- played in current mission file (Illu- mination Portion)  XMIT key pressed promptly; polling status played (Illumina- tion Portion)					BCS	Review message	Message reviewed;	FSO,		EXEC key pressed	Observe gun orders	
with SOP and mitted to FSO; Self played press EXEC key gun orders auto-matically computed and displayed; mission file (Illumination Portion)  Press XMIT key Gun orders trans-How. Sec., promptly; polling status displayed; FM; MTO displayed (Illumina-tion Portion)						in accordance	FM; RFAF trans-	BCS,		promptly; gun orders dis-	displayed on BCS	_
press EXEC key gun orders auto- matically com- played; mission placed; mission placed in current mission file (Illu- mination Portion)  Press XMIT key gun orders trans- mitted to How. Sec., polling sta- tus displayed; FM; MTO displayed tion Portion)						with SOP and	mitted to FSO;	Self		played		_
matically computed and displayed; mission placed in current mission file (Illuminariation Portion)  Press XMIT key Gun orders trans—How. Sec., polling states Sec.; polling states tus displayed; FM; MTO displayed; tion Portion)						press EXEC key	gun orders auto-					_
puted and dis- played; mission placed in current mission file (Illu- mination Portion)  Press XMIT key Gun orders trans- How. Sec.; polling sta- tus displayed; FM; MTO dis- played (Illumina- tion Portion)							matically com-					_
played; mission placed in current mission file (Illu- mination Portion)  Press XMIT key Gun orders trans- How. Sec., polling sta- tus displayed; FM; MTO dis- played (Illumina- tion Portion)							puted and dis-					
placed in current mission file (Illumina- mination Portion)  Press XMIT key Gun orders trans How. Sec., promptly; polling states ts displayed (Illumina- tion Portion)  mission file (Illumina- tion Portion)  XMIT key pressed promptly; polling status and FM; MTO displayed transplayed (Illumina- tion Portion)							played; mission					
mination Portion)  Press XMIT key Gun orders trans-How.  mitted to How. Sec., polling sta-Self tus displayed; FM; MTO displayed tion Portion)							placed in current					
Press XMIT key Gun orders trans- How.  Press XMIT key Decised mitted to How. Sec., promptly; polling status Sec.; polling sta- Self tus displayed; FM; MTO displayed tion Portion)							mission file (Illu-					
Press XMIT key Gun orders trans- How. XMIT key pressed mitted to How. Sec., promptly; polling status Sec.; polling status displayed; FM; MTO displayed; FM; MTO displayed (Illumination Portion)							mination Portion)					
v. Sec., promptly; polling status ita- Self and FM; MTO displayed na-					BCS	Press XMIT key	Gun orders trans-			XMIT key pressed	Observe polling status	_
ita- Self and FM; MTO displayed				•			mitted to How.	Sec.,		promptly; polling status	and FM; MTO dis-	
tus displayed; FM; MTO displayed (Illumination Portion)							Sec.; polling sta-	Self		and FM; MTO displayed	played	
FM; MTO dispayed (Illumina- played (Illumina- tion Portion)							tus displayed;					
played (Illumina- tion Portion)							FM; MTO dis-					
tion Portion)							played (Illumina-					
							tion Portion)					

Observe READY and FIRE SHOT indication on BCS Assessment Method Observe FM; FOCMD: pressed promptly and SHOT message transpressed promptly and FM; FOCMD:READY READY message dis-Observe XMIT key Observe XMIT key Observe XMIT key pressed correctly Date: 3/23/84 played on BCS Present C. Preusser Page 3 of 5 nitted Revision 0 SHOT message transmitted promptly (HE Portion) Observe READY and FIRE SHOT indication on BCS XMIT key pressed 10 seconds before impact (HE Analyst: promptly; FM; FOCMD: READY message (HE Por-Performance Standard(s) XMIT key pressed display (HE Portion) XMIT key pressed promptly tion) displayed [ ] Procedural (Pixed, Structured)
[X] Variable (Cognitive, Semi-Structured) Portion) minsec Time Task Classification FO/ FIST, Self FO/ FIST, Self FO/ FIST, Self FIST Self. F0/ READY indication Self ted (HE Portion) nessage displayed message displayed; countdown initi-SPLASH message 'IST (Illumination eived from How. Sec. (HE Portion) FM; FOCMD: from How. Sec.; FM; FOCMD: rom How. Sec.; M; MTO trans-FOCMD:SPLASH DATA/ACK indi FOCMD: READY ation received READY indica-Outputs ransmitted to mitted to FO/ SHOT message transmitted to FM: FOCMD: tion received ortion); FM; ndication re-FO/FIST: FM; Proquites: BCS Initialized
Digital Comm. Established :O/FIST (HE HE Portion) Content Portion) to impact; press XMIT key 10 seconds before flight 10 seconds message Press XMIT key Observe time of impact of round Press XMIT key to transmit FM; Splash countdow to transmit FM; FOCMD:SPLASH Press XMIT key message; start FOCMD:SHOT Monitor gun ready/firing Actions status Process Equip-Stop-watch Stop-watch ment BCS BCS BCS BCS BCS Gun READY and SHOT Gun READY Content Gun ACK Computer (BCS Operator) From How. dow. How. Šec. Factors Affecting Performance (2)Note: SHOT and SPLASH messages are not required Function(s)/Tasks FDCSection Position(s) Subsystem

message transmitted

FO/FIST (Illumination Portion)(2)

READY message

transmitted to

Task Classification: Proquinites: BCS Initialized Digital Comm. Established

Section Position(s)	Computer (BCS Operator)	S Operat	tor)	•	Digital Comi	Digital Comm. Established	Proced	edural (Pixed.	Bevision ()	
							(X) Variabl	e (Cognitiv	(X) Variable (Cognitive, Semi-Structured) Analyst:	C. Preusser
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip-	Actions	Content	<u>-</u>	Time	Performance Standard(s)	Present Assessment Method
		ᆮ	Audible Alarm		Press ALARM	Alarm and FIRE	How.		ALARM ACK key pressed	Observe Alarm off
		FIST	on; FIRE MSN		ACK key once	MSN lamp off;	Sec.,		promptly	
			Lamp on			gun orders auto-	Self	•		
						matically trans-				
						mitted to How.				
						Sec.; polling sta-		-		
						tus updated				
				BCS	Press NEXT SEG	Press NEXT SEG FM; RFAF meg-	Self		NEXT SEG key pressed	Observe FM; RFAF
					key 4 times	sage displayed(3)			promptly	(Illumination Portion)
(3)Note: FM;					•	(Illumination Por-				displayed on BCS
MTO, FM; FOCMD:						tion)				
SHOT and FM;		FO/	Audible Alarm	BCS	Press ALARM	Alarm and FIRE	How.		ALARM ACK key pressed	Observe Alarm off
FOCMD:SPLASH		FIST	on; FIRE MSN		ACK key once	MSN lamp off;	Sec.,		promptly	
messages not re-			Lamp on			gun orders auto-	Self			
quired			•			matically trans-				
) ) •						mitted to How.				
-,-						Soa : polling sta-				
		_				sec., politing sta-				
						tus updated	,		- Out Hand	444
				BCS	Press NEXT SEG	Press NEXT SEG FM; RFAF mes-	Self Self		NEXT SEG key pressed	Observe FM; KFAF
					key 4 times	sage displayed:			promptly	(HE Portion) displayed
(4)Note: Same as						(HE Portion)""				on BCS
Note 3.		FO/		BCS	Press ALARM	Alarm and FIRE	Self		ALARM ACK and RCVD	Alarm and FIRE MSN
		FIST	on; FIRE MSN		ACK key once	MSN lamp off;			MSG keys pressed promptly lamp off; FM; SUBS	lamp off; FM; SUBS
			Lamp on		and RCVD MSG	FM; SUBS mes-				message displayed
			•		key twice	sage displayed				
		_			22111	(Illumination Por-				
						tion)				
				BCS	Review message	FM; SUBS auto-	F0/		EXEC key pressed	Observe display
					in accordance	matically trans-	FIST.		promotive display cleared	cleared
					with SOP and	mitted to FO/	How.			
_					nress FXEC key		Sec.			
					(a)	iner	Self			
						tion Portion) 110-	:	_		
					_	ליים ויים ויים ויים ויים ויים ויים ויים				
						Gated In Tile to				
					_	EOM, EOM				
						transmitted to				
						olav cleared				
-	_	_	_	_		_	<del>-</del>	-		_

Performance Standard(s)

ALARM ACK and RCVD

Alarm and FIRE MSN

MSG keys pressed promptly lamp off; FM; SUBS message displayed Date: 3/23/84 Observe display cleared Page 5 of 5 Pages C. Preusser Revision 0 Analyst: EXEC key pressed promptly; display cleared [ ] Procedural (Fixed, Structured)
[X] Variable (Cognitive, Semi-Structured) Task Classification: minsec Time FO/ FIST, How. Sec., Self se Se sage displayed (HE Portion)
FM: SUBS automatically trans-EOM transmitted to How. Sec.; mission (HE Por-Alarm and FIRE tion) updated in file to EOM; MSN lamp off; FM; SUBS mes-Outputs display cleared mitted to FO/ FIST; current Proquisites: BCS Initialized Digital Comm. Established Content in accordance with SOP and press EXEC key ACK key once and RCVD MSG key twice Review message Press ALARM Actions Process Equipment BCS BCS Audible Alarm on; FIRE MSN Content Lamp on Inouts Computer (BCS Operator) FO/ FIST Affecting Performance Factors Function(s)/Tasks FDC Section Position(s)

1.

Dutputs  I I Variable (Capatitive, Benit-Structured)  In Variable (Capatitive, Benit-Structured)  Analyst: J.  Time  Tim	Subsystem PDC				Preques	Preparates: Prepared Firing Chart	Proguestes: Prepared Firing Chart	That Class	cifinalion.	P se 1	7
Fectors houlds freeling from Content mean Actions Content To Initiate Performance Standard(s)  Mignetic From Content Mean request to Initiation of task Self from Content and determine Standard(s) from their request to Initiation of task Self from Content and defermine Performance Standard(s) interpretation of the Content and defermine Standard from the Self from Self Self (some form) of the Self (some form) of		D So (Chart	Derator		•			M. Property	here) (Pired	Revision	0 Date: 12/28/83
Factors   Fact					į			i j Variab	le (Comitiv		J. Hamilton
Hardes Felige From Content Bould Request to Known Hear request to Initiation of task Self and Victorian Performance Performance Performance Standardia)  Resk a Name Series of Content and Content Politic Round Politic Actions Performance Performan		Factors		Inputs		rocess	Outputs				
Targets, and Angelescent of Request to Known point and declaration of task Self (FD Sp) (Chart data. Task is initiated permitty) point known point and declaration of task Self (FD Sp) (FDC-verbice) chear trange certificition chemistron of the chart range certification chemistron of the chart range certification chemistron of the chart range certification chemistron of the chart range certification chemistron of the chart range certification chemistron of the chart range certification chemistron of the chart range certification chemistron of the chart range certification chemistron of the chart range certification conditions and chemistron of the chart range certification conditions and chemistron conditions and chemistron conditions chart chart chemistron chart chemistron chart chemistron chart chemistron chart chemistron chart chemistron chart chemistron chart chemistron chart chart chemistron chart c	Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content		Time (minsec)	Performance Standard(s)	Assessment Method
ask a & Name Frequency of Name		-	2			1			00.00	Chart Acts	Joseph Paris Carolina
le Name restriction of termination of termine chart range (bit 280-100) (FDC-velocie) chart range (chart range (chart range (chart range)) (FDC-velocie) (chart range) (FI pg 10) (FDC-velocie) (chart range) (chart	Data		2		point			(FD Sp)	99:90	tiated promptly	element
Targets, equipment, condinates, equipment, equi	OH Tuck # A Nome				data	and determine					
Targets, gloves, equipment, chart, scale failtnium) asted. RP on the continue and chart, scale failtnium) asted. RP on the continue and chart, scale failtnium) asted. RP on the chart he fairt, for the coordinates and too day to the coordinates and too days.  89 e.g., target Firing Using RPP, bat- Chart range to RP Din termine chart bind plotting piliti	061-280-1001	(FDC-vehicle)									
reme and equipment, pointing and plotting and pointing chart age (e.g. glove).  Seale (-) of known point (Alumi- coordinates and pointing chart and and pointing chart and asset (B))  By e.g., target (Chart age to Chart, tery center, Chart range to RP (FD Sp.)  By e.g., target (Chart).  By e.g., target (Chart).  By carget (Ch		9) Personal			Firing		Plotted and desig-	Self		RP accurately plotted and	_
Section   Chart   Pub.   Section   Control of the control of the	Plot Targets,	equipment,			Chart, Plotting	scale (atuminum)	firing chart	C - 2		meters (SM)	
Section   Angle   mask   (Alumi- coordinates and ton Angle   mask   (Alumi- coordinates and ton Angle   mask   (Alumi- coordinates and ton Angle to Berland   Plotting RP designation   Plotting RP designation   Plotting RP designation   Plotting RP designation   Plotting RP designation   Plotting P	Announce Chart	helmet.			Scale	E'ot known point	ρ	Š			
100 Opera-   100	Data (and Angle	mask			(Alumi-	coordinates and		FDO			
Chart range accurately   Plotting RP designation   Plotting RP designation   Plotting Chart range accurately   Plotting Using RDP, bat- Chart range accurately   Chart ra	£	10) Opera-			num),	tick mark and					
Firing Using RDP, bat- Chart range to Self Chart range accurately Chart, tery center, 16-40 (Chap- Piotting plotting	tional state,			Plotting	RP designation						
First Chart, tery center, Potting bin, de-Potting pin, de-Robert Range accurately Protting pin, de-Robert Chart range to RP Ch FD, Protting pin, de-Robert Chart range (Ch FD) Robert Chart range (Ch FD) Announce chart Chart range (Ch FD) Announced (FM) Announced (FM) Sp Announced (FM)		e.g., target			E .						
Plotting plotting pin, dependent of the plotting plotting pin, dependent termine chart termine chart termine chart termine chart cha		peol			Firing	Dat-	Chart range to	200		Chart range accurately	verily by measuring
Pin, termine chart Sp. RDP range to RP None Announce chart range FDO, chart range correctly announced (FM) announced (FM)	References/ Notes				Plotting			Ch ED		meters (SM)	
RDP range to RP FDO. Chart range correctly range announced (FM) announced (FM) Sp Sp Sp Sp Sp Sp Sp Sp Sp Sp Sp Sp Sp	- FM 6-40 (Chan-				Pin	termine chart		9			
(FM6-13E) None Announce chart range (Ch FD announced (FM) announced (FM) (Ch FD announce	ter 3, Section				RDP	,		F.00			
range announced (PM) Sp Announced (FM)	î				None	art	Chart range	FDO,		Chart range correctly	Compare announced
	. SM(FM6-13E)						announced	ව ව		announced (FM)	chart range to deter-
								B			mined chart range
								8			
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Registration points a suit of capted to consider the consideration of capted to consider the consideration of capted to capted the capted to capte	Terection Capanities		(Pixed, Structured)		
Affecting Affecting Performance From Content ment  Is) Restricted Bn FDC Request/deci- visibility due or self sion to con- to environ- mental con- ditions, e.g., chart of ditions, e.g., chart of darkness, smoke, fog, known etc.  2) Noise within the FDC T) High roommunica- tions load (digital/ voice) 9) Personal equipment (e.g., gloves, mask, hel- mas		IXI Veriable (C	[X] Variable (Cognitive, Semi-Structured)		Anelyst: J. Hamilton
Reguest/deci- tied Bn FDC Request/deci- due or self sion to con- with  n- (FDO). duct precision known and the con- tiest/ registration points  g. chart of chart con- points  points  none  e  FD Sp Announcement RDP  ca- FD Sp Announcement RDP  de chart con- wes. Candance with  range to RP fan  candance with  regard to use of ammunition  and knowledge of enemy capabilities to detect the firing unit's location  ac- SOP Communica- tion security procedures  with	Outputs				
tied Bn FDC Request/deci- due or self sion to con- list/ registration points But chart of duct precision known apolited Registration points Registration points Rown Rown Points But Cmdr Commander's None Registration Rome Registration Rome Registration Rome Rome Rome Rome Rome Rome Rome Rome	Content	To Tries		Performance Stundard(s)	Present Assessment Method
due or self sion to con- List/ duct precision known bn- List/ registration points g. chart of g. known points points  Rome  e  FD Sp Announcement RDP of chart cange to RP fan regard to use of ammunition and knowledge of ammunition and knowledge of enemy capabilities to firing unit's location ac- SOP Communica- firing unit's location ac- sort,	Initial selection	FD	00:00 Select a	Select a known point	Compare selection of
n- (FDO), duct precision known beneficially registration points plotted below points points points points points of chart points of chart plan can be considered by capabilities to capabilities to detect the firing unit's location and knowledge of enemy capabilities to detect the firing unit's location and security procedures but the considered by the capabilities to detect the firing unit's location and knowledge of enemy capabilities to detect the firing unit's location and knowledge of enemy capabilities to detect the firing unit's location and knowledge of enemy capabilities to detect the firing unit's location security procedures wort,	of a known point	S S	which is	which is suitable and, to	RP to those available
e FD Sp Aurouncement RDP of chart of chart of plotted plotted plotted plotted points  Points Aurouncement RDP of chart carge to RP fan cargerd to use of ammunition and knowledge of ammunition and knowledge of enemy capabilities to detect the firing unit's location security procedures  SOP Communica- SOP tion security procedures  mis-  Sort,	to conduct regis-	Jias	extent po	extent possible, minimizes	for determination of
e Plotted Points Nome Points Points None Points None Points None Points Points Points Points Points Points Points Points Point Points Point Points Point Points Point Points Point Points Point Points Point Points Point Points Point Points Point Points Point Points Poin	tration firing (	(FDO)	detection	detection by enemy target	suitability and likeli-
plotted  known  Per known  Per known  Per known  Per known  Per known  Per chart  Per chart  Per known  Per Commander's None  Ves.  Caidance with  Per Caidance with	- t		location a	location agencies (FM)	hood of detection by
Per known points None  Ea-FD Sp Announcement RDP of chart Carage to RP fan Guidance with regard to use of ammunition and knowledge of enemy capabilities to detect the firing unit's location for tion security procedures sort,	- CM	_			enemy target location
within the FDC  7) High communications load (digital/ ions load (digital/ sample)) voice)  9) Personal equipment (e.g., gloves, gloves, mask, heltional state, met)  ter 10) Operation and knowledge (ional state, etc., location ity to detect the weapon's fire, etc., location tion, e.g., type of mission support, eremy	<u>a.</u>				agencies
within the FDC  7) High in the from within the from communications load (digital/ solves)  9) Personal equipment Cmdr Commander's None (e.g., gloves, mest)  10) Opera—  11) Opera—  12) Noice of ammunition and commander's none (e.g., gloves, mest)  13) Personal cmdr Commander's None (e.g., gloves, mest)  14) Opera—  15) Noice of enation and knowledge of enemy abil—  16) Opera—  17) High of chart (GIT (GIT (GIT (GIT (GIT (GIT (GIT (GIT	1	6	Doguest	Deciron is along in moder-	Observe subsequent
within the  FDC  7) High  communications load  (digital/ ) voice)  9) Personal  equipment  (e.g., gloves, mask, heltional state, ity to detect the weapon's fire, etc., location signs support, eremy  10) Communication and knowledge of enemy abilities to detect the versall taction security ition, e.g., type of mission support, eremy  10) Communication and knowledge of enemy procedures  11) Communication and knowledge of enemy procedures  12) Aurouncement RDP  13) Chart GIT  24) Communication and knowledge of enemy procedures  14) Communication and knowledge of enemy procedures  15) Personal  26) Communication and knowledge of enemy procedures  16) Communication and knowledge of enemy procedures  17) High  18) Personal  26) Communication and knowledge of enemy procedures  18) Personal  27) Communication and knowledge of enemy procedures  28) Personal  29) Personal  20) Personal  20) Personal  20) Personal  20) Personal  21) Commander's None  22) Communication  23) Personal  24) Personal  25) Personal  26) Communication  26) Personal  27) Communication  28) Personal  28) Personal  29) Personal  20) Personal  20) Personal  20) Personal  21) Commander's None  22) Communication  23) Personal  24) Personal  25) Personal  26) Personal  26) Personal  26) Personal  26) Personal  27) Personal  28) Personal  29) Personal  20) Personal  20) Personal  20) Personal  20) Personal  20) Personal  21) Personal  22) Personal  23) Personal  24) Personal  25) Personal  26) Personal  26) Personal  26) Personal  26) Personal  27) Personal  28) Personal  29) Personal  20) Personal  20) Personal  20) Personal  20) Personal  21) Personal  22) Personal  23) Personal  24) Personal  25) Personal  26) Personal  26) Personal  26) Personal  26) Personal  27) Personal  28) Personal  28) Personal  29) Personal  20) Personal  20) Personal  20) Personal  20) Personal  21) Personal  22) Personal  23) Personal  24) Personal  25) Personal  26) Personal  26) Personal  26) Personal  26) Personal  27) Personal  28) Personal  28) Personal  29) Personal  2	verbal request	de d'a	stood B	Requires no inter-	Action by FD Sc
rDC  7) High on communica- tions load (digital/ voice) 9) Personal equipment (e.g., gloves, mask, hel- met) 10) Opera- tional state, eremy abil- ity to detect the weapon's fire, etc., location  overall tac- toverall	-	2	ילפוני און כאווי און באווי	determining chart	
section communications load tions load (digital)  (digital)  (sp) voice)  9) Personal equipment Cmdr Commander's None (e.g., gloves, mask, helmapter 10) Operation state, encounties and knowledge of enemy ability to detect the firm unit's firm unit's location soon support, tion, e.g., type of mission support, enemy since enemy sion support, enemy since enemy sion support, the firm sion support, since enemy enemption since enemy enemption	from Battery		אובומווסוו		Secretaring chart
tions load (digital)  (sp) voice)  (sp) voic	Center to KP	***		70 ,	Company EDO/Ch ED
tions load of chart digital/ range to RP fan voice)  9) Personal equipment Cmdr Commander's None equipment Cmdr Cuidance with regard to use mask, hel- of ammunition and knowledge tional state, capabilities to lity to detect the weapon's firing unit's weapon's fire, etc., overall tac- son support, tion enemy sur- action lower low	Knowledge of		Correct	Correct assessment of	S. account of
(digital/ range to RP fan voice)  9) Personal equipment Cmdr Commander's None (e.g., gloves, mask, hel- regard to use mask, hel- of ammunition hapter 10) Opera- tional state, enemy abil- capabilities to lity to detect the weapon's firing unit's firing unit's fore overall tac- voverall tac- soverall tac- soverall tac- sion support, tion, e.g., tion, e.g., tion, e.g., tion, e.g., sour- action lower firing the sion support, tion, e.g., t	available charges	(FO/	aldaliava SS (SS)	available charges to reach	de assessinent of
9) Personal 89 equipment Cmdr Commander's None (e.g., gloves, mask, hel- 6-40 (Chapter 10) Opera- Sec. I) met) enemy abil- 1 (FM6-13E) fire, etc., etc., spir reduces fire,	that will reach	C FD	KF (FM)		available charges to
9) Personal Reg. gloves.  rences/Notes mask, hel- 6-40 (Chapter 10) Opera- 1 (FM6-13E) ity to detect the ity to detect the weapon's ge reduces fire, etc., abut en- 1 sign support, sound assument of mis- 1 sign support, askinize sur- 1 sign support suppor	RP				opservers' assessment
rences/Notes mask, hel- met) met) met) met) met) met) met) met)					
rences/Notes mask, hel- met)  Meto-40 (Chapter 10) Opera- Sec. 1)  I (FM6-13E)  I (	Selection of	Sel	Correct	Correct charge is selected	
mask, hel- met) met) met) and knowledge tional state, enemy abil- ity to detect weapon's fire, etc., overall tac- tical situa- tical situa- type of mission support, enemy action	charge to RP.	(FO/	Dased on	based on Commander's	
met)  of ammunition and knowledge tional state, enemy abil- ity to detect weapon's fire, etc., overall tac- tical situa- tical situa- type of mission support, enemy action	Retain charge	Ch FD	Cuidance	Guidance and knowledge of	
tional state, tional state, tional state, enemy abil- ity to detect weapon's fire, etc., overal! tac- tical situa- tion, e.g., type of mission support, enemy action	knowledge as an	- G	enemy's	enemy's detection capa-	
tional state, of enemy enemy abil- capabilities to lity to detect the firing unit's fire, etc., overall tac-lical situal tion, e.g., type of mission support, enemy action	_	_	Dilities		
enemy abil- capabilities to ity to detect the firing unit's fire, etc., overall tac- SOP Communication, e.g., type of mission support, enemy action	Fire Order	_			
ity to detect the weapon's fire, etc., location overall tac- SOP Communication, e.g., type of mission support, enemy action	- -				
weapon's firing unit's fire, etc., location overall tac- tion security tion, e.g., type of mission support, enemy action					
fire, etc., overall tac- tical situa- tion, e.g., type of mis- sion support, enemy action					
tical situa- tical situa- tion, e.g., type of mission support, enemy action	-		-		
tical situa- tion, e.g., procedures type of mis- sion support, enemy action	Secure communi-	- IIV	Communic	Communication procedures	Monitor communica-
tion, e.g., procedures n type of mission support, n. enemy rr- action wer	cation procedures	comm.	are rigid	are rigidly followed by all	tions for Violetion of
type of mission support, n. enemy rr- action wer		-dinba	radio and	radio and telephone opera-	_
sion support, n. enemy nr- action wer	dly with SOP's	ment	tors on F	tors on FDC radio (digital/	cednres
n. enemy wer action inc.		opera-	voice) an	voice) and wire nets (SM)	
action		tors in			
-		FDC			
charge should be		digital.			
charge should be		VOICE			
		wire			
		nets			
					(continued)
		_			

Subsystem FDC				-	Commander's Guidance	Guidance		•	7 304	rage 2 of 2 Pages
Section Position(s)	FDO/Ch FD Sp	,		•	Knowledge of	howledge of Enemy Firing	I Proce	Task Classification:   ) Procedural (Fixed		
						CHARACTER	(X) Verset	de (Cognitiv	[X] Variable (Cognitive, Bemi-Structured) Analyst:	J. Hamilton
	Factors		friouts	*	Process	Outputs				
Function(s)/Tasks	Per	From	Content	Equip- ment	Actions	Content	To	Time (minsec)	Performance Standard(s)	Present Assessment Method
								Variable	Registration should be accomplished only when absolutely necessary (SM)	Assessment of the need to register and selected registration technique
1.10										
		<del>-</del> -								
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Page 1 of 2 Pages	Revision 0 Date: 3/26/84		Analyst: C. Preusser
	k Classification:	Procedural (Fixed, Structured)	M. Variable (Comitine Semi-Structured)
RCS Initialized	Prequisites: Digital Comm. Established Tes		
	Manufactor Manufactor	Section Position(s) Computer (BCS Operator)	

	Present Assessment Method	රි	VD Observe FM; RFAF mptly message displayed on BCS	mptly Observe gun orders displayed on BCS	mptly Observe polling status displayed	n on Observe ACK indication on display mptly Observe FM; FOCMD: READY message displayed	ation Observe READY indication on display mptly Observe READY message transmitted to FO/FIST	
	cl Performance Standard(s)	X X	ALARM ACK and RCVD MSG keys pressed promptly	EXEC key pressed promptly	XMIT key pressed promptly	Observe ACK indication on BCS display XMIT key pressed promptly	Observe READY indication on BCS display XMIT key pressed promptly	
7	Time (minsec)	00:00						
	Ţ,	ye Self	Self	Self	Sec	i- Self - FO/ FIST Self	Self FO/ e FIST	
Outputs	Content	Initiation of task	FM; RFAF message displayed	FM; RFAF auto-matically transmitted to FSO; gun orders auto-matically computed and displayed; mission placed in current	Gun orders transmitted to How Sec; polling status displayed; FM; MTO mes-	DATA/ACK indi- cation received from How Sec FM; MTO trans- mitted to FO/ FIST; FM; FOCMD: READY	message displayed READY indica- tion received from How Sec FM; FOCMD: READY message transmitted to FO/FIST*	
Process	Actions	Observe alarm and FIRE MSN	Press ALARM ACK key once and RCVD MSG key twice	Review message in accordance with SOP and press EXEC key	Press XMIT key	Monitor gun polling status Press XMIT key	Monitor gun polling status Press XMIT key	
	Equip- ment	BCS	BCS	BCS	BCS	BCS BCS	BCS BCS	
Inputs	Content	Audible alarm on. FIRE MSN				Gun ACK	Gun READY	
	From	FO/ FIST				How Sec	How Sec	
Factors	Affecting Performance		1b) Visibility equipment 3) Moving vehicle	4) Tempera- ture and/or humidity extremes 5) Weather 6) Terrain 7) High	tion load  9) Personal equipment and/or clothing 10) Opera-			
	Function(s)/Tasks	Determine Piring Data		SM Task # & Name ture and/or (No SM #) humidity extremes Determine Firing 5) Weather Data for a Target 6) Terrain of Opportunity - 7) High	TRI: 74  References/Notes  - TM11-7440-283-	3, Pg. 125) [Advance Copy]	*Note: FO/FIST transmits FM; FOCMD: FIRE to How Sec	

## GUNNERY TEAM ENGAGE INPUT-PROCESS-OUTPUT (IPO) ANALYSIS BCS Initialized

Subsystem - DC				Prequi	Proquisites: District Community		Thank Cles	Task Classification:		70/00/0
Section Position(s)	Computer (BCS Operator)	S Oper	tor)			rstablished	Proced	hrel (Pixed	[ ] Procedural (Fixed, Structured)	1
							(X) Verleb	e (Cognitiv	e, Semi-Structured) Avaiyst:	C. Preusser
	Factors		Inputs		Process	Outputs				
Function(s)/Tacks	Affecting Performence	E C	Content	Equip-	Actions	Content	٤	Time (minsec)	Performance Standard(s)	Assessment Method
Carrie (Cilicia de la carrie de	ו בו וא ווומוורב		ANII ANII A	300		A1 2-4 10-2	Ī		POSSESSION ACK LOSS	Observe of line of other
		FIST	Audibie alarm on. FIRE MSN	وري ا	ACK key once	Alerm and Lamp off; polling status			promptly; observe first gun	
			Lamp on			indicates first gun fired			fired on BCS display	display
-				BCS	Press XMIT key	First FM;	FO/		XMIT key pressed promptly Observe FM, FOCMD:	/ Observe FM, FOCMD:
					•	FOCMD: SHOT	FIST		,	SHOT message trans-
					_	message trans- mitted to FO/				mitted
						FIST				
				BCS	Press PREV SEG	Second FM;	Self		PREV SEG key pressed	Observe second FM;
						message displayed			from the state of	sage displayed on BCS
		How	Gun SHOT	BCS	Monitor gun	SHOT indication	Self		SHOT indication on BCS	Observe SHOT indica-
		Sec			S	received from				tion on BCS display
					Т	How Sec				
				BCS	Press XMIT key	Second FM;	FO/		XMIT key pressed promptly Observe FM; FOUND:	Closerve rm; rocmu:
						FOCMD: SHOT	FIST			SHOT message trans-
						message trans-				יייווופס
						mitted to ro/ FIST				
		F0/	Audible alarm	BCS	Press ALARM	Alarm and Lamp	Self		ALARM ACK and RCVD	Observe FM; SUBS
		FIST	on. FIRE MSN	!	ACK key once	off: FM: SUBS			MSG keys pressed promptly	
		<u>:</u>	Lamp on		and RCVD MSG	EOM message				on BCS
			•		key twice	displayed				
				BCS	Review message	EOM transmitted	How		EXEC key pressed	Observe BCS display
					in accordance	to How Sec;	Sec.		promptly; display cleared	cleared.
-					with SOP and	display cleared;	Self,			Observe elapsed time
	•				press EXEC key	current mission	F0/			
						updated to EOM	FIST			
						and deleted; FM;				
,						SUBS transmitted				
						to FSO				
						_				

Prequisites: Sep Load Ammo Available Figze Wrencher, Setters Provided Task Classification:

Date: 11/28/83

ø	Section Position(s)	Cannoneers (C2.3.4.HD)	3.4.HD)			Might Lite	Night 1:0 Design Design	IXI Proced	heat (Pixed	Structured)	1 Mare: 11/28/83
ļ		1				Sec. Hand Tools. Available	ols Available	( ) Verieb	e (Cognitiv	[ ] Variable (Cognitive, Semi-Structured) Analyst:	C. Preusser
		Factors		Inputs		Process	Outputs				
	Curation(c)/Toche	Affecting	1		Equip-	Antions	***************************************	É	Time	Donformondo Stondondie)	Present
_	runction(s)/ 185Ks	reriormance		Content	men	ACHORIS	Content	9	minsec	rei 101 III alice otaligard(s)	Assessingin method
	Prepare Ammo for F. ring (C2,3,4,HD)	1a) Visibility Ch Sec due to dark-	Sec Ch	Fire com- mands	None	Hear announced fire command	Initiation of task	ຍ	00:00	Preparation of ammunition task is initiated promptly	Observe performance
		ness 5) Weather		announced shell (1.2)							
		(snow, rain,			None	C3 Repeat	Repeated shell/	C3,(Self)		Shell correctly repeated	Compare repeated shell
	Prepare Separate-	sleet)			11.7	shell/rounds	rounds	Ch Sec		(SM/TM)	to announced shell
	' ading A nmuni-	6) Terrain			Shell	Select shell ac-	Shell selected ac-	3		Color codes and markings	compare selected shell
	tion for Firing	(desert, jun-				codes and mark-	cording to an- nounced shell	(Hage)		on shell selected correctly (SM)	
		8) Work				ings stenciled on					
	<u>TRI:</u> 61	space re-				shell and con-			-		
3-7	References/Notes:	Striction 9) Personal			Shell	Remove any	Cleaned/undam-	င်ဒ		Shell is free of any for-	Visually inspect shell
<u> </u>		equipment				sand, dirt, oil or	aged shell	(Self)		eign matter and is not	for cleanliness
	5	and/or cloth-				grease on shell			•	damaged or corroded (TM)	
		4) ing including				and inspect for					
	• SM (FM6-13B)	gloves and				damage and cor-					
	1) All ammunition				Shell		Remove grommet Cleaned rotating	င္ပဒ		Rotating band properly	
	preparation accom-				Gromme	and examine ro-	pand	(Sel.)		inspected and cleaned	sure rotating band is
	plished outside				Kotat-	tating band to			-	(TM)	free of dirt and burrs
	howitzer				ing S	ensure it is free					
	2) Shell, luze and				Dand	OI GIFT BING DUFFS					
	enarge preparation				Shell	Visually verify	Shell inspected	ເວ		Shell properly inspected	Observe shell ready
_	necessarily per-					entire shell is	and held upright	(Self)	_	and ready for fuzing (TM)	for fuzing
	formed sequen-					free of foreign	for fuzing				
	tially	_				matter/defects			•		
						and hold shell			_		
						uprignt 10r 1uz- ing					
		<u>1</u>	Ch Sec	Fire com-	None	C4 Repeat an-	Repeated charge	C4,		Charge correctly repeated	Compare repeated
				mands		nounced charge		(Self),		(SM/TM)	charge to announced
				announced				HD, Ch Sec			charge
_				P	Propel-	Select charge	Charge selected	C4,HD		Charge selected correctly	Compare selected
					lant	according to an-	according to an-	(Self)		compares to charge an-	charge to announced
					Cnarge	nounced life command	agarua paaunou			nounced (1 M)	ગુર્ધા પ્રદ
_	_	_			_			_	_	_	_

13%

	nowitzer			Predu	Prequisites: Sep Load Ammo Available	mo Available	Thank Class	ification:	1	
Section Position(s)	Cannoneers (C2,3,4,HD)	C2,3,4,H	(Q	•	Fize Wrench	Fuze Wrencher, Setters Provided	X Proced	teel (Pixed	Structured)	1 Date: 11/28/83
					Night Life Device Provide Sec Hand Tools Available	Night Lite Levice Provided Sec Hand Tools Available	Variabl	e (Cognitiv	i i Variable (Cognitive, Semi-Structured) Analyst:	C. Preusser
	Factors		Inouts		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	<u>0</u>	Time minsec	Performance Standard(s)	Present Assessment Method
		-		Propel- lant	Remove charge from metal con-	Charge unpacked, inspected and	C4, HD (Self)		Charge correctly unpacked and inspected (TM)	Visually inspect charge is free of tears, dirt,
				Charge	tainer and in-					etc.
					spect for torn					
					der grains and/					
					or discoloration					
					and indication					
					that charge is fresh (4)					
			-	Propel-	T.,		C4, HD		Igniter pad correctly	Visually inspected
				lant		þ	(Self)		inspected and free of tears igniter pad (free of	igniter pad (free of
				Charge	SS	and serviceable			and wetness (TM)	defects)
				,	(powder grains					
				gniter	should move					
				bad	freely inside the					
				Propel-	e straps	1	C4, HD		Charge properly prepared	Compare prepared
				lant	ex-	L	(Self)		in accordance with	charge to announced
				Charge	cess powder	nounced charge			announced charge (TM)	charge
					increments ac-					
					cording to an-					
					nounced charge					
					secure straps			-		
				Unused	g	Unused powder	C4, HD		Unused powder increments	Visually inspect unused
				powder	powder incre-	nts	(Self)		placed in secure area (TM)	
		_		inere-	ments in secure	secured				secure
				ments	Brees (5)	Destooted ignition	Un V		formation and free of motions Visitally increased	Vicually incomposed
				lant	nad from wet-	_	Self)		or demage (TM)	igniter pad free of
				Charge	ness or damage				0	wetness or damage
				løniter	until loaded	_				
				рвd	-					j
				Propel-	T	ç	CI		Properly hand propelling	<del>†                                    </del>
				lant	ng B	properly handed			charge, prepared according	
				Charge	charge to C1	15 et			to fire command, to (1) (TM)	charge
			-2							
			_					_		_

Subsystem Howitzer	tzer			Predui	Prequisites: Sep Load Ammo Available	mo Available	That	. Give time.		
Section Position(s)	Cannoneers (C2,3,4,HD)	234 HE	2		Fuze Wrenche Night Life De	Fuze Wrencher, Setters Provided 1938 Constitution Night Lite Device Provided WI Procedural (Fix	MI Proced	ural (Pixed,		- 1
					Sec Hand Tools Available	ls Available	( i Variabl	e (Cognitiv	e, Semi-Structured) Analyst:	C. Preusser
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	To	Time minsec	Performance Standard(s)	Present Assessment Method
			ma am	None	C2 Repeat an- nounced fuze	Repeated fuze	C2,(Self) Ch Sec		Fuze correctly repeated	Compare repeated fuze to announced fuze
			7211	Eyebolt	Remove eyebolt	Fuze well/socket	C2 (Self)		Fuze well/socket inspected	Visually inspect fuze well/socket free of
	<u> </u>			blug	gasket and	free of damage				damage, rust, dirt or
			·	Gasket	examine tuze well/socket for	and/or toreign material				nign explosive material
					damage, rust,					
					explosive residue (6)			<del>-</del>		
				Fuze	Select fuze ac-	Fuze selected	C2		Fuze selected correctly	Compare selected fuze
					cording to fire	according to	(Self)		compares to announced	to announced fuze
				E. I.	Pomono monto	Supplementation	6.7		Supplementary observe ro-	Compara announced
				Lorse Cl. Co.	mentery observe	obstancements	و د		supplementary charge re-	firse to prepared firse
					if required by	if required	(1)		יייים ייים ייי	agni pa pada id agni
				₹0 	lifting loop (7)					
					Screw fuze into	Fuze ready to be	(2) (2)		Fuze properly prepared	Visually observe fuze
					snell by nand and then back	Seated on snell	(Hag)		ior sebung (iimi)	ready for scaling
					off 1/4 turn					
				Fuze	priate	Fuze seated in	C2 C3		Fuze shoulder seated	Visually observe fuze
				F11.70	Tuze setter	snell	<u> </u>		against sneit without gap (TM)	seared without gap
				Setter	fuze so that					
				Wrench	fuze shoulder is					
					seated firmly					
				Fuze	(Fuze Q or De-	Fuze set to de-	C2		Fuze action set in accor-	Compare announced
				Setter	lay) Using ap-	sired fuze action	(Self)	-	dance with Fire Command	fuze action to pre-
-				Wrench,	propriate fuze				(SM)	pared fuze action
				Fuzed	setter wrench,					
				Shell	turn slot to					_
					sired fuse action					
					if required					
_	_	_	_	- -	_	_	_	-		

									Jo to a seed	of 4 Pages
Subsystem Howitzer	zer			Prequi	sites: Firze Wronche	Prequisites: Fize Weencher Setters Provided Task Classification:	That Class	ification:	and and and and and and and and and and	غ ا
Section Position(s)	Cannoneers (C2.3.4.HD)	22,3,4,H	(0		Night Lite Device Provide Sec Hand Tools Available	Night Lite Device Provided See Hand Tools Available	IX Proced	ural (Pixed, e (Cognitive	1/3 Procedural (Fixed, Structured) [ ] Variable (Cognitive, Semi-Structured) Analyst:	C. Preusser
	Factors		Inouts		Process	Outputs				
Function(s)/Tasks	Affecting	From	Content	Equip-	Actions	Content	2	Time	Performance Standard(s)	Present Assessment Method
	2211211			Fuzed	(Fuze Time)	Fuze set to de-	T		Desired time set without	Compare announced
				Shell	Remove safety	sired time setting (Self)	(Self)		error to the nearest .01	fuze setting to pre-
									sec (SM)	pared fuze setting
				Fuze						
				Watter Wash	priate fuze set-					
				Mencil						
				Fuzed	C2 Pass fuzed	Fuzed shell	CI		Properly inspected and	Compare prepared/
				Shell	shell to C1	handed to C1		•	fuzed shell handed to C1 (TM)	fuzed shell to an- nounced shell

Septimon Housing	Homitage Continu				Homitzer I ai				Page 1	of Pages
The state of the s	1000			Tege.	Prequisites: Collimator Emplaced	mplaced	Task Classification:	fication:	Revision 3	3 Date: 11/30/83
Section Position(s)	Gunner (G)				Boresighting Completed Pre-fire Checks Perform	Boresighting Completed Pre-fire Checks Performed	[X] Procedu [ ] Variable	rel (Pixed, : (Cognitive	X  Procedural (Fixed, Structured)   Analyst:	Analyst: J. Hamilton/R. Bloom
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip-	Actions	Content		Time minsect	Performance Standard(s)	Assessment Method
Lay Howitzer for Direction and Quadrant (G, AG, Ch Sec)		Ch Sec GDU	on de-	CDU	need ed	f task			Deflection task is initiated promptly (SM)	ರೆ
SM Task # & Name due to Pan- 061-266-2229 tel 5) Weather	due to Pan- tel 5) Weather			None	Repeat an-Reparonne Reparention deflection	eated deflec-	Ch Sec		Deflection is correctly repeated (SM)	Compare repeated de- flection to announced/ displayed deflection
Sct/Lay the How- itzer for Deflec- tion (G)				Pantel	imuth equired	Indication of set deflection	Self (G)		Deflection is correct on reset counter (SM)	
TRI: 61   References/Notes   TM9-2350-303-10 (Chapter 2,	equipment and clothing incl. gloves and mask			Pantel, Colli- mator, Thavers- ing Con- trol(s)	nowit- colli- iighted antel	Indication of aligned reticles (Pantel and Collimator)	Self (G)		Pantel and Tube and Collimator are aligned to within 0 mils (SM)	
Pg. 2-151) • SM (FM6-13B)		AG	Announcement of elevation "Set"*		Hear announced "Set"	Continuation of task to completion	Self (D)		"Set" is heard correctly (TM)	None
Note: *Announcement of "Set" can occur any time prior to Gunner				Pantel mount	Center pitch and Indications of cross-level vial centered bubble bubbles on the Pantel mount	oles	) (2) (3)		Bubbles are centered (SM)	Compare bubble positions to centering marks
centering bubbles				Pantel, Colli- mator, Travers- ing Con- trol(s)	re- re- ure	Indications of: • Set deflection • Bubbles centered • Aligned Pantel- (Collimator sight picture	Self (G)		Deflection is correct on reset counter. Bubbles are centered. Pantel and Collimator are aligned to within 0 mils (TM)	
				None	Announce "Ready"	Announcement of deflection "Ready"	Ch Sec		"Ready" is correctly an- nounced at proper time (SM)	Hear "Ready" an- nouncement after "Set" announcement
								00:15 Total	Deflection is accurate to within 0 mils (SM)	Measure time for total task of laying howitzer to proper deflection
							<del></del> -			

Subsystem Howitz	Howitzer Section			Ē	Proquisites: Safety T Completed for	pleted for	Task Classification	ification:		0 5-11/23/03
Section Position(s)	Chief of Section	10:1			Howitzer Laid		IXI Proced	urel (Pixed	[X] Procedural (Pixed, Structured)	1
					Digital Comm	Digital Comm. Estab'd w/FDC	Veriebl	• (Cognitiv	e, Semi-Structured) Analyst:	K. Bloom
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content		Time Iminsec	Performance Standard(s)	Present Assessment Method
Process Pire	1a) Visibility,		Displayed Fire	5	Receive audible	Initiation of	_		Audible alarm and visual	Observe performance
Commands	envitonmen-		Command: Audible ularm	(SCA)	alarm and visual	Fire Command	(Ch Sec)		signals observed promptly (TM, TC)	
	5) Weather		and message		Announce "Fire	Announcement of G	S		Announcement made accu-	Compare announcement
Lay Howitzer for	9) Personal		header		Mission," number		ΑG		rately and in correct	with data and format
Direction and	equipment				of gun, number		ပ		format (TM, FM)	guidelines
Quadrant	and clothing				of mission, type	number of mis-				
I and Howitzer					of mission con- trol	sion, type of				
		_		SCA	Press CYCLE	Acknowledgment	FDC		Key is pressed promptly	Observe performance
Fire Howitzer					key	signal			(TM, TC)	
SM Tack # A Name				SCA	Observe ACK in	Decision that	Sel		ACK is observed properly	Ch Sec proceeds to
061-266-3315					display window	ACK was sent	(Ch Sec)		by Ch Sec (TM)	next appropriate step
		FDC	Fire mission	SCA	Cycle through	(see below)			(see below)	(see below)
Determine that the	<b>A</b> 5		data (stored in	_	Fire Mission					
Howitzer is Safe	_	-	SCA)	V US	Dance CVCI E CT	Display of part	1100		CVCI R boy is peocean	Observe promotivess of
to rire (Ch Sec)				۲) در	other SCA tone	_	Ch Coo		without delen	outling
TD1. 61		,			to display data	mission massage			Without detay	String.
					to dispitate data	element				
References/Notes				SCA	Read/announce	Announcement	Ð		Message element is cor-	Compare displayed with
					data from Com-	of next or re-	AG		rectly announced (FM).	announced message
- FM6-50 (25 Mar					mand bar and	quested fire	ပ		(Later) Message element	element
83)					sednential dis-	mission message			is correctly repeated (see	
TC6-1-2 (May 83)					piety Window:	element or com-			next IPO Items)	
- 1 1 - 1 4 4 0 - 6 1 - 1 1 - 1 1 - 1 1 - 1 1 1 1 1 1 1					sion of the	2				
					• Type of mis-					
Related task of					sion control		-			
"Operate GDU/					• Special					
SCA" analyzed					instructions					
separately.					• Shell					
					• Rounds					
			-		Charge					
					• Fuze					
					• Deflection		•			
					• Time					
					• ל בובאמרוסנו					
								_		

	Howitzer Section				Cofotu T Com	inloted for			Page 2	2 of 4 Pages
				Treda.	requisites: Each Charge	a a a a a a a a a a a a a a a a a a a	Task Classification:	lication:		Revision 0 Date: 11/23/83
Section Positions)	Culei of Section	uon			Howitzer Laid Digital Comm	Howitzer Laid Digital Comm. Estab'd w/FDC	IXI Procedur [ ] Variable	of (Pixed, (Cognitive	IXI Procedural (Fixed, Structured)  [ ] Variable (Cognitive, Semi-Structured) Analyst:	t: R. Bloom
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting  Performance	From	Content	Equip-	Actions	Content	<u>. 5</u>	Time	Performance Standard(s)	Present State   Assessment Method
		⊢	l g		Hear repeated				Commands are correctly	3
-		ပ	mands		commands	commands were heard	(Ch Sec)	<u>=</u>	repeated (FM)	with repeated com- mands
	<del></del>	G, AG,	AG, Request repeat		jo	Decision to re-	Self		Repeat requests are cor-	
		ပ	of commands		repeating com- mands	peat commands	(Ch Sec)	<del>-</del>	rectly heard (FM)	is repeated
				SCA	Repeat com-	ated com-	G, AG,		Command is repeated cor-	$\vdash$
					inands as needed	mand	<u></u> ပ_	=	rectly (FM)	
	·			SCA	Compare data to		Self		Safety of data is correctly	
				and	Safety T	ğ	(Sec.)	<u> </u>	determined (FM)	mination with Safety 1
				T	data are safe	summants and sand				
					• If data are	Announcement of	G, AG,		Announcement of "Unsafe	_
					outside limits,	"Unsafe to Fire"			to Fire" is correctly made (FM)	de   ment with prescribed
					"Unsafe to	WILLI FERSOIIS			( M T	
					Fire" and give					
					• Take correc-	As needed	As		As specified in governing	g As appropriate
					IIVE BCIIOII	Ī	Danagar		JOCALII CII CALIOII	July son Carrier
					Report unsafe     conditions	Report of unsafe conditions			Unsale conditions are reported correctly (FM)	compare report of unsafe conditions with prescribed format
		Self	Fire mission		Observe that	(See below)			(See below)	(Sec below)
		(Ch Sec)data SCA	data		weapon and am- munition are					
	_	۷	Ouedront "Cot"		Sale Hoer "Cot"	Degision that	3		"Sot" is correctly board	None until next
		2	Augulant Set		130		(Ch Sec)		2	
		ŋ	Deflection		. Hear "Ready"		Self		"Ready" is correctly heard	rd "Ready" heard after
			"Ready"	*		deflection is ready	(ငှာ <b>%</b>		(FM)	
		Equip-	Actual shell,		• Compare ob-	Decision that	JIS (Self		Decisions (that settings do/	do/ Compare decisions with data and actual
			Janet, Charles		settings, shell,	conform to			rectly made (FM)	_
					fuze and	data				
	-				a					
	_		_	_	_	_	_	-		_

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Frectors   Frectors	Secarystem flowing	nowitzer Section			Prequ	Prequisites: Jane 1 Charge	200	Task Class	Task Classification:	Š	Revision 0	Date: 11/23/83
Affecting Affecting Actions Content Equity Content Decision that objects are not a structions and tree of the content of the recognition of the content of t	Section Position(s)	Chief of Section	Ē			Howitzer Laid	34	IXI Proced	ural (Pixed,		-  	11/53/03
Process						Digital Comm	Estab'd w/FDC	[ ] Variabl	e (Cognitiv		lyst:	R. Bloom
Affecting From Content Baulo Actions to Finance From Content To Insure no On Persison that ob-Self Minaged Decision that ob-Self Front of Sun Structions ared (Ch. Seo) are correctly made (FM) are not in way of gun) are not in way of gun) are not in way of gun) are not in way of gun) are not in way of gun) are not in way of gun) are not in way of gun) are not in way of gun) are not in way of gun) are not in way of gun) are not in way of gun) are correctly made (FM) in recoil path Fuel Minaged Self Unsafe cond. St. A if tunsale cond Ching of Gun is/is not correctly mand to check Fire Minaged Self M		Factors		Inputs		Process	Outputs					
Gun structions to structions are (Ch Sec)  Foot of gun way front of gun way front of gun in recol path front of gun in recol path (Ch Sec)  Self Unself condi SCA	Function(s)/Tecks	Affecting Performance	From	Content	Equip- ment	Actions	Content		Time	Performance Standar	(s)p	Present Assessment Method
structions to structions are (Ch Sec) are orrectly made (FM) are not in way of gun) are not in way of gun, of gun, of gun is shell, loading of gun is/is not charge at land and "Cherge or I unsafe con- Announcement of G. AG announcement is made (FM) mounce "Gun "Fire" made properly (FM) mounce "Gun "Fire" made properly (FM) mounce "Gun "Fire" made properly (FM) mounce "Gun "Fire" made properly (FM) mounce "Gun "Fire" made properly (FM) mounce "Gun "Fire" made properly (FM) mounce "Gun "Fire" made properly (FM) mounce "Gun "Fire" made properly (FM) mounce "Gun "Fire" made properly (FM) mounce "Gun "Fire" made properly (FM) made properly (FM) mounce "Gun "Fire" made properly (FM) made properly (FM) made properly (FM) mounce "Gun "Fire" mounce "Gun "Fire" mounce "Gun "Fire" mounce "Gun "Fire" mounce "Gun "Fire" mounce "Gun "Fire" mounce "Gun "Fire" mounce "Gun "Fire" moun					Gun	Insure no	Decision that ob-	8		Decisions (that obstruc	H	Compare decisions
front of weapon or of gun in recoil path of gun is/is not lobserve safe becision that Self becision that Self becision that Shell, loading of gun is/is not loaded safely) is correctly made (FM) and is safe and if READY message FDC by FIRE gun; and the command of Gr. Ack) message is promptly and clearly (FM) and the command of Gr. Gun No." Fire gun is safe and if READY message FDC by FDC (TM, TC) is sappropriate and the command to FIRE; and th						structions to	structions are/	(Ch Sec)		are/are not in way of		with observed area
weapon or of gun  Gun, Observe safe Decision that Self Decision (that gun is/is not SEA)  In recoil path loading of gun is/is not Charge  I unsafe con- Amouncement of G, AG Announcement is made (FM)  Fire"  I unsafe con- Amouncement of G, AG Announcement is made (FM)  Fire it as appropriate As a If WR, and if READY message FDC Announcement to fire is and the common and the common and the common and the common and the common and the common and the common and the common appropriate Announcement Common and the com						front of	are not in way			are correctly made (FI		round gun
in recoil path  Gun. Observe safe  Shell, loading of gun is/is not charge  Charge  I unsafe con- Announcement of G. AG  Announcement is made  Announcement is made  Fire"  I unsafe, take As appropriate As corrective action is taken corrective action. as appropriate As appropriate As AMC, press  READY  Fire gun:  I family and clearly (FM)  Fire gun:  I family and clearly (FM)  Printe  SCA I family and safely (FM)  READY message FDC  Announcement G  Announcemen						weapon or	of gun					
School is a Conserve safe Decision that Self Decision (that gun is/is not Fuze, loaded safely)  Charge House, weapon Charge are dition, com—  SCA of I will will be suppropriate and the com—  SCA of I will will be suppropriate and the com—  SCA of I will will be suppropriate and the com—  SCA of I will will be suppropriate and the com—  SCA of I will will be suppropriate and the com—  SCA of I will will be suppropriate and the com—  SCA of I will will be suppropriate and the com—  SCA of I will will be suppropriate and the com—  SCA of I will will be suppropriate and to I will be suppropriate and the com—  SCA of I will will be suppropriate and the com—  SCA of I will will be suppropriate and wisher signals and the com—  SCA of will will be suppropriate and wisher signals and the com—  Manual to FIRE:  SCA of Will will be suppropriate and wisher signals and the com—  SCA of will will be suppropriate and wisher signals of "Stand By"  Safety is correctly that will be suppropriate and wisher suppropriate and promptly (FM. TM)  (AMC.)  Continue ob—  Announcement to fire is and the com—  Announcement and celearly (FM)  Announcement to fire is and the com—  Announcement will be suppropriate and wisher signals of "Stand By"  (AMC.)  Continue ob—  Announcement will weapon is safe or not safe (C.) Scale in promptly and and promptly and and promptly weapon is safe or not safe or not safe or not safe will be suppropriate.  (FMI.)			•			in recoil path					-+	
Fuzze, weapon loaded safely   Institute of the control of the co					Gun,	l .		Self			_	Compare decision w
Charge weapon loaded safely made (FM)  Charge If unsafe con- SCA dition, com- There Fire"  If unsafe, take As appropriate As As As As As As As As As As As As As					Shell,	loading of	gun is/is not	(Ch Sec)				rew's adherence to
SCA If unsafe conducement of G, AG Announcement is made dition, command "Check Fire" and "Check Fire" and "Check Fire" appropriate As appropriate As appropriate As appropriate As appropriate As corrective action, as appropriate action, as appropriate AMC, press READY message FDC By FDC (TM, TC) and the common and the command to FIRE:  SCA If Safe, and if READY message FDC By FDC (TM, TC) and WR, and and the common and the command to FIRE:  SCA If AMC, redection and the command to FIRE:  SCA If AMC, redection and the command to FIRE:  SCA If AMC, redection and the command to FIRE:  SCA If AMC, redection and the command to FIRE:  SCA If AMC, redection and the command to FIRE:  SCA If AMC, redection and the command to FIRE:  SCA If AMC, redection that Self Safety is correctly and promptly a					Fuze,	weapon	loaded safely		-	made (FM)	-	rescribed data and
SCA of funsale, take As appropriate As corrective action is taken promptly and clearly (FM) mand "Check Fire"  • If unsale, take As appropriate As corrective action is taken corrective action, as appropriate priate priate priate priate  SCA • If safe, and if READY message FDC AMC, press READY  Fire gun;  • If WR, an of "Gun No.";  nounce "Gun "Fire"  No.", "Fire"  No.", "Fire"  Acknowledge FDC AMC, press made properly (FM) mand to FIRE;  send acknowl-  edgment Announcement (rew Announcement made eleurly of "Stand By" of "Stand By" of "Stand By" and promptly (FM. TM)  • Continue ob Precision that Self Safety is correctly observed upon (FM) and promptly and prom			,		Charge	7	A	į		A second		procedures
Mand "Check Fire"  If unsafe, take As appropriate As torrective action is taken approtion, as approt			- G	Unsare condi-	SCA	• II unsale con-	Announcement of	5		Announcement is made		announcement near
mand to check.  Fire (CHECK)  If unsafe, take As appropriate As corrective action is taken tion, as appropriate ap			200	tion or com-		dition, com-	"Check rire"		_	promptly and clearly t	_	ind acred upon by
FR)  • If unsafe, take As appropriate As corrective action is taken ton, as approtion, as a printer and as a printer and the command to FIRE.  • If AMC, com- SCA • If AMC, re- Acknowledge FDC Audible and visual signals and the command to FIRE.  • Common and the command to FIRE.  • Common of "Stand By" Announcement Crew Announcement made cleurly and promptly (FM. TM)  • Continue ob- Diction that Self Safety is correctly weapon is safe or not safe or not safe or not safe				mand to check	-	mand "Check						rew
corrective action is safe or tion, as appropriate appropriate action is taken tion, as approtition, as approtion, s approtion, as approximately as approximately appropriate and as approximately appr				FR)		נונה						
SCA • If safe, and if READY message FDC printe printe sappro- printe printe and if safe, and if READY message FDC by FDC (TM, TC)  READY FIVE gui; • If WR, and nouncement G made properly (FM) nounce "Gun No.", "Fire" Announcement to fire sand the command to fire ceive alarm (ACK) message FDC honouncement (Trew and the command to FIRE; seed acknowledge and the command to FIRE; seed acknowledge and the command to FIRE; seed acknowledge and the command to FIRE; seed acknowledge and the command to FIRE; seed acknowledge and the command to FIRE; seed acknowledge and the command to FIRE; seed acknowledge and promptly (FM, TM) and promptly (FM, TM) and promptly instands correctly weapon is safe or not safe (Th Sec) (FM)				<u>:</u>		. If unsafe, take	As appropriate	As		Corrective action is ta	٦	Compare corrective
Fire gui:  If AMC, com- SCA  • If safe, and if READY message FDC  READY READY READY READY READY READY READY READY READY READY Received  Announcement G Announcement of "Gun No."; Rand to fire Reduce alarm Announce alarm Announcement Ready Ready  Announcement of "Gun No."; Rand to fire Announcement Ready  Announcement of "Gun No."; Rand to FIRE; Reduce alarm Announcement Ready  Announcement Announcement Ready  Announcement of fire is Announcement Ready  Announcement Announcement Ready  Announcement Announcement Ready  Announcement Announcement Ready  Announcement Announcement Ready  Announcement Ready  Announcement Ready  Announcement of fire and trongity (FM)  Ready  Announcement of fire and promptly (FM)  Announcement to fire and promptly (FM)  Ready  Announcement of fire is Announcement of fire is Announcement to fire and the companity (FM)  Announcement to fire and the companity (FM)  Announcement of fire and the companity (FM)  Announcement of fire and the companity (FM)  Announcement to fire and the companity (FM)  Announcement to fire and the companity (FM)  Announcement to fire and the companity (FM)  Announcement to fire and the companity (FM)  Announcement to fire and the companity (FM)  Announcement to fire and the companity (FM)  Announcement to fire and the companity (FM)  Announcement to fire and the companity (FM)  Announcement to fire and the companity (FM)  Announcement to fire by FDC  Announcement						corrective ac-		appro-		promptly and safely (F		action with prescrit
SCA • If safe, and if READY message FDC READY message is received by FDC (TM, TC)  READY  READY  READY  READY  READY  READY message is received by FDC (TM, TC)  READY message is received by FDC (TM, TC)  READY  READY  READY  READY  READY  READY message is received by FDC (TM, TC)  made properly (FM)  made properly (FM)  made properly (FM)  made properly (FM)  made properly (FM)  made properly (FM)  made properly (FM)  made properly (FM)  made properly (FM)  and the command to FIRE:  serie gun:  (ACK) message  mand the command to FIRE:  serie gun:  (ACK) message  Announcement (Trew  Announcement made clearly and promptly (FM. TM)  (AMC)  • Continue ob-  serving that weapon is safe or not safe  (AMC)  • Continue safe or not safe  (Ch. Sec)  (FM)				-		tion as appro-		printe				procedures: FDC
SCA • If safe, and if READY message FDC READY message is received AMC, press  READY message FDC TM, TC)  Fire gun;  If AMC, com- No."; "Fire"  If AMC, com- SCA • If WR, an- nounce "Gun No."; "Fire"  Mand to fire and the com- mand to FIRE; send acknowl- edgment • Announcement • Announcement • Announcement • Announcement • Announcement • Announcement • Announcement • Announcement • Continue ob- serving that weapon is safe (C) Sec   Barnet Correctly weapon is safe or not safe (C) Sec   Barnet Correctly (FM)  (FM)  Announcement to fire is made properly (FM)  Announcement to fire is made promptly (TM, TC)  Announcement made clearly and promptly (FM, TM)  (AMC)  (C) Sec   Safety is correctly ob- serving that weapon is safe (C) Sec   Barnet Correctly and promptly acted upon (FM)						priate						notified if necessar
Fire gun,   Announcement G   Announcement to fire is					SCA		READY message			READY message is rec		ompare sent with
Fire gun;  If AMC, com- No."; "Fire"  No."; "Fire"  No."; "Fire"  No."; "Fire"  Announcement of "Gun No.";  No."; "Fire"  Announce glam  and the com- mand to fire  and the com- mand to FIRE;  sedgment  Announcement to fire is  Announcement to fire is  made properly (FM)  Audible and visual signals  observed promptly (TM, TC)  and the com- and the com- edgment  Announcement made clearly  (AMC)  continue ob- serving that weapon is safe (Ch Sec)  (FM)  (AMC)  (AM						AMC, press			•	by FDC (TM, TC)		peeived READY
Fire gun; Announcement G Announcement to fire is mounce "Gun No."; "Fire"    If AMC, com- SCA						READY					7	essage
nounce "Gun No."; "Fire"  No."; "Fire"  No."; "Fire"  And the command to fire  edgment  Announcement Crew  (AMC)  Continue ob- Scrving that weapon is safe or not safe  No."; "Fire"  Acknowledge FDC  Addible and visual signals  Abricounce "Gun No.";  Addible and visual signals  Abricounce FDC  Addible and visual signals  Abricounce of FDC  Addible and visual signals  Abricouncement (FW, TC)  Announcement Crew  Announcement made clearly  and promptly (FM, TM)  Safety is correctly ob- scrving that weapon is safe or not safe  (FM)						Fire gun;	Announcement	ت		Announcement to fire		bmpare announce-
No.": "Fire"						• If WR, an-	of "Gun No.";			made properly (FM)		nent with preseribe
If AMC, com- SCA   I CAMC, re-   Acknowledge   FDC   Audible and visual signals						nounce "Gun No ". "Eire"	"Fire"					orocedures; (Later) Observe fire
edyne alarm (ACK) message observed promptly (TM, TC)  and the command to FIRE; send acknowl- edgment  • Announce  • Announce  • Announce  • Announcement Crew Announcement made clearly and promptly (FM, TM)  • Continue ob- serving that weapon is safe (Ch Sec) and promptly acted upon (FM)  • (AMC)  • Continue ob- serving that weapon is safe or not safe  (FM)			FDC	If AMC, com-	•		Acknowledge	FDC		Audible and visual sign		Compare sending of
and the command to FIRE; send acknowl- edgment  • Announcement (Trew Announcement made clearly and promptly (FM, TM)  (AMC)  • Continue ob- serving that weapon is safe (Ch Sec) (FM)  (FM)				mand to fire		ceive alarm	(ACK) message			observed promptly (TM		nessage and ACK a
send acknowl- edgment Announcement (Crew Announcement made clearly "Stand By" of "Stand By" (AMC) (AMC) Serving that weapon is safe (Ch Sec) and promptly acted upon (EM)  (AMC)  Serving that weapon is safe or not safe (Ch Sec) (EM)  (EM)				(FIRE)		and the com-						EDC
send acknowl- edgment Announcement (*Tew Announcement made clearly and promptly (FM, TM) (AMC) (AMC) Serving that weapon is safe (**) Sec) weapon is safe or not safe (FM)						mand to FIRE;						
edgment Announce Announcement ('rew Announcement made clearly and promptly (FM, TM)  (AMC) (Continue ob- Decision that Self Safety is correctly observing that weapon is safe or not safe ('h Sec) and promptly acted upon (FM)						send acknowl-		-				
Announce Announcement ('rew Announcement made clearly stand By" of "Stand By" and promptly (FM, TM)  (AMC)  Continue ob- Decision that Self Safety is correctly observing that weapon is safe ('h Sec) and promptly acted upon (FM)						edgment						
"Stand By" of "Stand By"  (AMC) Continue ob- Decision that Self Safety is correctly observing that weapon is safe ("h Sec) and promptly acted upon (FM)						Announce	Announcement	Crew		Announcement made c	arly	Observe crew in
(AMC)  Solf Selety is correctly observing that weapon is safe or not safe (ch Sec) and promptly acted upon (FM)						"Stand By"	of "Stand By"			and promptly (FM, TM		standby positions
serving that weapon is safe (c'h Sec) served; hazards correctly weapon is safe or not safe (c'h Sec) (F.M.)						(AMC)						
is safe or not safe  (F.M)							Decision that	1 Sel		satety is correctly oo- served, bazards correct		nazarus aereo upon n aecordanee with
Is safe or not safe the safe that the safe of the safe that the safe tha						Serving that	weapon is safe	13.X	_	actived, liazards correct	_	and the contract of the contra
						weapon is safe	or not safe			and promptly aeted up (EM)		reseribea procrauit
									•			

			CONN	ERY TEA	GUNNERY TEAM ENGAGE INPUT-PROCESS-OUTPUT (IPO) ANALYSIS	r-PROCESS-OUTP		ANALT		Page 4 of 4 Pages
Subsystem Howitze	Howitzer Section			Prequi	Prequisites: Safety T Completed for Each Charge	pleted for	Task Classification	ification:	Revision	0 Date: 11/23/83
Section Position(s) C	Chief of Section	g			Howitzer Laid Digital Comm	Howitzer Laid Digital Comm. Estab'd w/FDC	(X) Proced	ural (Pixed e (Cognitiv	[X] Procedural (Pixed, Structured) [   Variable (Cognitive, Semi-Structured) Analyst:	R. Bloom
	Factors		Inputs		Process	Outputs				
Emotion(c) /Teeks	Affecting	Prom	Content	Equip-	Actions	Content	وع	Time minsec	Performance Standard(s)	Present Assessment Method
CHICAGON AND A	TO THE INDIVIDUAL		THE STREET		. If safe, an-	Announcement of C1	ر <u>ت</u>		Announcement made clearl	Ö
					nounce "Fire" (AMC)	"Fire"	Crew		and promptly (FM, TM, TC)	
		Cun	Firing of gun	Gun	Observe fire;	Announcement of G, AG,	G, AG,		Announcement made clearly	y Compare time of
					• If mailtunction,	"Mistire" or	n DC		and prompuy (FM)	time of occurrence
					amonica	tion	22.			
				As	• Take correc-	Corrective ac-	As		Corrective action is taken	Compare corrective
				Deeded	malfunction	nanaau se non	nanaan	•	prompting and sarety (1 m)	procedures
				SCA	. If proper fire,	SHOT/RC mes-	FDC		SHOT/RC message is cor-	Compare time of fire
					press SHOT/	sage			rectly received (IM, IC)	with receipt of mes-
					round is fired					age at 100
				SCA	<ul> <li>Successively</li> </ul>	Message ele-	Self		Desired message element	Compare desired with
					press CYCLE	ments	ල් දිට දිට		is correctly acquired and	acquired and an-
					or other SCA				announced (IM, IC)	accuracy and con-
					noince as					sistency
					needed					
				SCA	• Press SHOT/	SHOT/RC mes-	FDC		SHOT/RC message is cor-	Compare fire time of
					RC one extra	Sage, twice			rectly and promptly re-	linal round with re-
		•			final round is	(IIIIAI round)			ceived at FDC (IM, IC)	FDC
				<u>.</u>	fired that				Post-fire procedures are	Compare actions taken
					Dost-fire pro-				taken promptly, correctly	with prescribed pro-
					cedures (e.g.,				and as needed (FM)	cedures
				-	bore clear) are					
					accomplished ff not clear	Initiation of	G. AG.			
•			_		take correc-	corrective ac-	ပ			
					tive action	tion, as needed				

## GUNNERY TEAM ENGAGE INPUT-PROCESS-OUTPUT (IPO) ANALYSIS Howitzer Laid

Subsystem Howitze	Howitzer Section		!	Prequ	Proquestes Howitzer Laid	Setubid w/EDC	Task Classification:	ification:	Previous	0 Date: 12/13/83
Section Position(s)	('hief of Section (('h Sec)	S 4.2)	(20)		Command to Use Cunner's		IXI Proced	ural (Fixed	[X] Procedural (Fixed, Structured)	R Bloom
					Quadrant				-	
	Factors		houts		Process	Outputs				
Function(s)/Tasks	م و	From	Content	Equip- ment	Actions	Content	To	Time (minsec)	Performance Standard(s)	Present Assessment Method
Lav Howitzer for	⊢	FDC	Fire Command, GDU	GDU	Receive GQ as	-iui	Self	00:00	GQ command is received	Observe performance
Direction and		! 	including GQ	(SCA)	special instruc-	tiate use of	(Ch Sec)		promptly and accurately	
Overheant	and clothing		(use Gunner's		tion while eyeling	Gunner's Quad-				
( ) V ( ) V ( )			Quadrant) and		through Fire	rant to set ele-				
CM Test # A Nemo			nundrant ele-		Mission Com-	vation	_			
061-966-3319			vation		mands					
8155-007-100				SCA	Announce use of	Announcement of G	S		GQ and other Fire Mission	Compare announced
Sot / Lay for Qued-					Gunner's Quad-	Gunner's Quad-	ΑG		Commands are announced	with SCA-displayed
Page with the					rant and remain-	rant and remain-C	ပ		promptly and accurately	commands
Chapter's Oredrent					der of Fire Mis-	ing commands				
Cotings 5 August and					sion Command,	•				
(320				_	including oundrant					
TBI. 50				Cuniver's	Set the an-	Completed set-	Seir		Quadrant elevation is set	Compare setting on
				Oued-	nounced quadrant	ting of Gunner's (Ch Sec)	(Ch Sec.)		to an accuracy of 0 mils	Gunner's Quadrant
Defendance /Notes				rant	on the Gunner's	Quedrant			on the Gunner's Quadrant	with announced quad-
Nei ereikes/ notes				(20)	Quadrant	•			(SM)	rant elevation
					Place the Gun-	Completed nosi- Self	19		Gunner's Quadrant is ori-	Compare positioning
• SM (FM0-135)				y 5	norte Onedrant	tioning of Gun-	(Ch. Sec.)		ented correctly and placed	of Gunner's Quadrant
01-505-055-5M1 •				,	on the howitzer's				firmly on the howitzer's	with prescribed posi-
(Chapter 2)					Chadrent coate				quadrant seats (TM)	tioning
					Cauralle Scats	los claust basalamas	19		AG admists our so that	Observe that GO bub-
		Y.	Activity of	<b>3</b>	Coserve that the	completed fever	1000		hibble is centered between	
			the Gunner's	5	AG IS operating	ing of the cun-	וכיו אבני		Jamelian morte (SM)	-
			Quadrant bub-		the elevation	ner's Cuadrant			levelling marks (3m)	merks
			Die Die		controls to level	onpoie				
	1		, , , , , ,		Domono Gunnon's	Decision that	3		GO is removed and stowed	Observe that setting
		2	Announced	2 C	Ouedhert from		و ج		upon determination that	
			quadrant	3	the gin's plud-	tion is set			correct quadrant is set	plete
-			lerevation Set		The guil 3 quad	136 51 1013				
					רמווו אבמוא מווע					
					return to stowed					
					IOCRITOLI			00.30	lay for quadrant to an	Compare GO setting
								(SM)	accuracy of 0 mils (SM)	with announced quad-
										rant, and observe
										centering of bubble
	_									

ALA: Colo	
5	2
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Subsystem Howitzer	zer			Precuis	Misfire Has Occurred	ecurred	1	e e	- F	of 1 Pages
Section Position(s)	Ch Sec/Cl			}				Mark (Pine)	Bevision	Dete:
							X Variet	e (Cognétiv	(X) Variable (Capalitive, Beni-Structured) Analyst:	
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	Ę.	Time (minsec)	Performance Standard(s)	Present Assessment Method
Fire the Howitzer	1a) Visibility Ch Sec (darkness) 8) Work-	නි දා		Lan- yard	}	Howitzer Fired	ت ت		Attempt to Refire initiated Observe performance promptly	Observe performance
SM Task # & Name 061-266-3322 Take Immediate	<b>a</b>	Ch Sec	Announce third "Misfire"		í	Tube is cold. (Go to (A.). (If hot, go to (B), below.)	CI		Accurate determination tube temperature (non-quantitative)	Observe performance
Action for Misfire	€	CI	Cold tube		Wait for two minutes	End of two min- utes	ပ		Timing accuracy	Observe
TRI: — References/Notes		Ch Sec,	End of wait- ing period	Primer Cham- ber	primer	er out of iber	Self,		Observe correct safety procedures	Observe
• FM6-13B (Pg. 5-		_	Primer out of chamber	Primer			<b>Self</b> , C1		Correctly identified primer condition	Observe
22) TM9-2350-303-10		Ch Sec	Primer Fired**		Wait for 8 min- utes	End of 8 minutes	Self.			
(Chapter 2) *Two attempts are		Ch Sec C1	End of wait- ing period		ove and charge.	Howitzer cleared	Self, C1		Observed correct safety procedures	Observe
made to refire.	<u></u>	CI	Hot tube		$\overline{}$	End of two min- utes	Self		Timing accuracy	Observe
proceed to next line.		ටු <b>Sec.</b> ට 1	Ch Sec, End of wait-	Primer Cham- ber	primer	er out of iber	Self, C1		Observed correct safety procedures	Observe
**If not fired, re-		Ch Sec	Primer out of chamber	Primer	Examine primer	Primer fired	دا دا		Correctly identify primer condition	Observe
and/or firing mechanism and attempt to fire		Ch Sec	Primer Fired**		Evacuate crew/ All crew evacurequest Ordnance ated. Assistance assistance		Self, Ord. Unit		Speed of evacuation	Observe

Subaystem Howitzer	-			•	Howitzer Laid				·  	
				Ē	Boresighting Completed	ompleted	Task Class	Task Classification:		Revision 2 Date: 12/1/83
Section Position(s)	Assistant Gunner	er			Pre-fire Checks Performed	ks Performed	IXI Proced	humal (Pixed		
					Communication Established	n Established	[ ] Varieb	te (Cognitiv	[ ] Variable (Cognitive, Semi-Brustured) Analyst:	C. Preusser
	Factors		Inouts		Process	Outputs				
	Affecting	ı	•	Equip-	;			Time		Present
Function(s)/Tasks	Performance	From	Content	ment	Actions	Content	,a	(minsec)	Performance Standard(s)	Assessment Method
Lay Howitzer for	9) Personal	FDC	Fire Command,	CDN	Receive Fire	Decision to			Fire command is received	Observe performance
Direction and			including quad- (SCA)	(SCA)	Mission Com-	announce Fire	Ch Sec		promptly and accurately	
Quadrant (AG, G,			rant elevation		mands (Ch Sec)	Mission (Ch Sec)				
Chece)	elothing, in-			SCA	Announce Fire	Announcement of G	<sub>S</sub>	00:00	Fire Mission Commands	Compare announced
SM Task # & Name cluding	cluding			!	Mission Com-	quadrant and	<b>V</b> C		are announced promptly	with SCA-displayed
061-270-1215	gloves and				mand including	remaining com-	<u>ن</u>		and accurately	commands
(AG)	mesk				quadrant	mands (Ch Sec)	ı			
		3		1140	(cn sec)					
Set/Lay the How-		2	rire Com-	200	onnced	Initiation of task Sell	ا ا		Quadrant task is initiated	None, until repeated
mish the Boner			SDURUL		quadrant See displane		3		promptiy	(See Delow)
Will the nange Quadrant			announced		ouadrant					
•			Displant				_			
TKI: 50		9	Displayed							
				None	Repeat an-	Repeated quad-	Ch Sec		Deflection is correctly	Compare repeated
References/Notes						rant			repeated (SM)	quadrant to announced/
										displayed quadrant
. TM9-2350-217-				Eleva-		Indication of an-	Sel Sel		Quadrant is correct on	Compare elevation
10 (Pg. 2-155)				tion	7	nounced quadrant	(VC)		elevation counter (SM)	counter to announced/
• SM (FM-6-13B)				quadrant	knob until an-	appears on eleva-				displayed quadrant
				control	nounced quadranttion counter	tion counter				
Note: *Gunner's				knob	appears on ele-	-				
actions (traversing)				Eleva-	vation counter					
are independent.				tion						
Therefore, comple-				counter			-			
tion of the travers-				Cross	_	Indication of	Self		Bubble is centered (SM)	Compare bubble posi-
ing action can				level	knob until cross	cross level vial	(S <b>Y</b>			tion to centering
occur at any time				Knob	a Se	bupple centered				merks
while the Assistant				Cross		on quadrant				
Cunner is complet-				level	quadrant mount	mount				
ing this task.				Vial						
				Quadran						
				mount						

					io I month and I	7			Pre-2	2 of 2 Pages	
Series Series	11661			Total Control	Proquisites: HOWITZET LAND	Completed	Task Clas	Task Classification:	Revision	ion 2 Date: 12/1/83	1/83
Section Position(s)	Assistant Gunner	13			Communication	Pre-fire Checks Performed Communication Established	(X) Proced	heral (Pined) le (Cognitiv	X  Procedural (Pixad, Structured) Analyst:     Variable (Cognitive, Semi-Structured)	st: C. Preusser	
	Factors		Inouts		Process	Outputs					
1								Time	č		ŧ
Function(s)/Tasks	S Performence	From	Content	ment	Actions	Content	٤	minsec	Periormance Standard(s)	<u>,</u>	Method
				tion	Operate eleva- tion control han-	vation level vial	(SE)	_	puppie is centered tom	tion to centering marks	ering marks
. <u>-</u>				control		bubble centered					)
				handle	tion vial bubble						
				Eleva-	centered						
				tion							
				vial							
		Gunner	Howitzer tra-	None	Aware that tra-	Indication of	Self		Traversing action stopped		versing
			versing action has stopped.*		versing action has stopped	traversing action stopped	( <u>A</u> G)		(I.W)	action stopped	<b>D</b>
D _ (				Cross	Verify cross	Indication of	Jes		Bubbles centered (TM)	Compare bubble posi-	oble posi-
				level	eva-	cross level and	(AG)			tions to centering	lering
				and ele-	पुर	elevation level				marks	þ
				vation	centered	bubbles centered					
				level						-	
				VIBI							
				Eleva-	Verify announced Indication of	Indication of	Self		Quadrant is correct on	Compare elevation	vation
				tion	quadrant appears	announced quad-	(AG)		elevation counter (TM)	counter to announced	nnounced
				counter	on elevation	rant on elevation				quadrant	
				Non	Appointer "Cot"	Appointer	Cumon	00.30	"Cott hoose based	Measure time for total	for total
				200		dindrent "Set"		00.00	Set near correctly (SM and TM)	thek of leving howitzer	o tor total
						dadi alle	Ch Sec			to proper quadrant	edrant
										nh laderid ca	oci alli
<del>-</del>											
	-										
								•		<del>-</del>	
										_	
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ANALYSIS
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O-SSEC
IN-PROC
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CHNNERY TEAM

Howitz	<b>a</b>				Fire Command					Page 1 of 3 Pages
			1	E .	Howitzer in Firi	Howitzer in Piring Position, Tube	That Class	Task Classification:	Revision	1 Date: 2/8/84
Section Position(s)	•				at Loading Elev	at Loading Elev. Breech Open	X Proced	beel (Pixed le (Comitiv	X  Procedural (Pixed, Structured)   J Variable (Cognitive, Bemi-Structured)	Analyst: C. Preusser
					rrepared nound			•		
	Factors		study		Process	Outputs				Precess
Function(s)/Tasks	Performance	From	Content	Equip-	Actions	Content	To	minsect	Performance Standard(s)	Assessment Method
Load Howitzer	4) Tempera-	Ch Sec	Fire	None	Hear announced	Initiation of		00:00	Loading task is initiated	Observe performance
SM Task # & Name	_		-announced		fire command	task			promptly	
061-270-1507	extremes		shell, charge and fuze							
1) <u> </u>	weather			Rammer	Pull rammer main Rammer located	Rammer located	C)		Rammer positioned cor-	Visually observe ram-
Load and Fire a	(snow, rain,			Main	release handle		(Self)			_
Prepared Round	sleet)			Release	and slide rammer	pointer in red			pointer in red band (TM &	_
(M109 Series)	9) Personal			Handle	back to rear	band			SM)	returned to red band
	equipment				stop; check poin-					
TRI: 61	and/or			Pointer	ter is in red band					
1	clothing			Cylinder	Grip cylinder re-		-       		Rammer correctly swung	Observe rammer up
References/Notes				Release	lease handle with				up and lorward and prop-	and lorward and prop-
				Handle	left hand and	pointer in black			erly latched; pointer cor-	erly latened; pointer
- FM6-13B (Pg. 6-					main release	Dand			rectly returned to black	correctly returned to
12)				Main	handle with right				Dend (I'M & SM)	Disck Daile
- TM9-2350-303-10				Release	hand and swing					
(Chapter 2)				Handle	rammer up and					
					forward until			=		
This analysis				Pointer	latched; check					
covers loading					pointer is in					
only.					Diack Dand	A. P. 4.5	Į.		- un un indopende activities	Weight obsessed outline
				Cylinder	Pull cylinder re-		ا ا		Cylliner correctly in the parameter cylline backed accidion and activities and activities and activities and activities and activities and activities and activities and activities and activities and activities and activities and activities are activities.	Visuality observe cylin-
				Kelease	lease handle to	_			to the cide (TM & CM)	and rotated to the
_				Handle	uniaten and	and rotated to			to the side (i'm d Sm)	side
			_		rotate cylinder	age alge				
		5	Projectile	Projec-	Place projectile	Projectile placed C1	CI		Projectile positioned cor-	Observe rear of projec-
		}	received	tile	on rammer tray	in correct posi-	(Self)		rectly on rammer tray	tile correctly positioned
					and slide projec-	tion on rammer			(TM & SM)	just beyond line on
_				Rammer	tile forward un-	tray				rammer tray
				Trav	til the rear of	•				
				•	the projectile is					
					just beyond the					
					line on rammer					
					trav					
										_
										•
-										
-	-		_	_	-	-	-	-		_

Sateyatem Howitzer	10			4	Premisites: Fire Command		1	Tech Classification		~ ~
Section Position(s) C1	_				Howitzer in Fire	Howitzer in Firing Position, Tube	IX Proces	des (Pine)	Revision 1	1 Date: 2/8/84
					Prepared Round		( ) Variab	de (Cognitiv	[   Variable (Cognitive, Semi-Structured) Analyst:	C. Preusser
	Factors		Inouts		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	To	Time (min:sec)	Performance Standard(s)	Present Assessment Method
		AG	Announced	Cylinder	Cylinder On the last digit	der	CI		Rammer cylinder properly	Observe rammer cylin-
			quadrant	Kelease	of announced	rotated up to			rotated and in latened position and handle	der properly rotated
			_		rammer cylinder	and handle re-			released (TM & SM)	and handle properly
					up to latched	leased				released
					position. Release					
					handle as soon as					
				Ram-	Push ram-	Projectile	CI			Observe projectile
				cylinder	cylinder actuator	rammed and	(Self)		rammed and seated (TM &	properly seated
				Actua-	lever IN until	seated			SM)	
				5 1	(approximately 4					
				2	seconds) and then					
					release actuator					
					handle	9			Dominion particular in the	Viciolly, obcome nom-
		_		Rolosco	Jeesse headle with	ward stowed	<u> </u>		ward stowed position:	mer in proper forward.
				Handle	right hand and	position: pointer	· ·		pointer correctly returned	stowed position and
					cylinder release	in black band			to black band (TM & SM)	pointer correctly re-
				Cylinder	handle with left					turned to black band
				Release	hand and pull					
					rammer fully to					
				Pointer	mer counter					
					clockwise and					
					push forward to					
					check pointer is					
		70	Decociliant	Propel-	in black band	Propellant	[J		Propellant charge properly	Visually observe propel-
		5	charge re-	lant	charge 3 inches	charge placed			loaded with red side show-	
_			ceived	Charge	inside rear of	inside rear of			ing (TM & SM)	properly with red side
					chamber or in	chamber with				showing
					groove with red	red side snowing				
					Side Side ing			_		
-	_	_	-	_	-	-	-	•		-

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Sataysten Howitzer	er			Peef	Maites: Fire Command Howitzer in Firin	Fire Command Howitzer in Firing Position Tube	Tesk Classification:	rification:	Revision	1 Date: 2/8/84
Section Positions) C1	1				at Loading Fle	at Loading Elev., Breech Open	X Proced	ural (Pixed	[X] Procedural (Fixed, Structured)	
					Prepared Round	nd	derreb	e (Cognitiv	e, Semi-Structured) Analyst:	C. Preusser
	Factors		Inputs		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	ဥ	Time (minsec	Performance Standard(s)	Present Assessment Method
				Operating Cam Handle	Visually insure red igniter pad showing, announce "CLOSE" and lift operating cam handle	Breechblock closed	ij		Breechblock correctly closed (TM & SM)	Hear "CLOSE" and visually observe breech-block closed correctly
				Witness Marks	Visually insure witness marks are aligned. If not: Release operating handle and push clutch pin in; hold in and push forward on operating handle which will rotate breech- block closed	Witness marks aligned	(Seif)		Witness marks correctly aligned (TM)	Visually observe wit- ness marks aligned
				Primer	Insert primer into primer chamber with flanged head of primer firmly seated against extractor	Primer inserted in chamber with flanged head seated firmly against extrac- tor			Primer properly inserted in chamber with flanged head seated firmly against extractor (TM & SM)	
				Firing Mechanism Block Assembly Follower	Push follower knob to slide firing mechanism block all the way to the left	Firing mechanism block all the way to the left	(Self)		Firing mechanism block correctly located all the way to the left (TM)	Visually observe firing mechanism block located all the way to the left

Subsystem Howitzer	tzer			į	Fire Comman	þ	i			7
since(s)					Howitzer in Firing Position	Firing Position	N Proper	INME CLASSIFICATION: N. Procedural (Pixed	Revision	0 Date: 1/26/84
					N SWED BIN	A SWAD BIN DUCKET OF WATER	i Verseb	te (Cognitiv	[ ] Verable (Cognitive, Semi-Structured) Analyst:	C. Preusser
	Factors		Inouts		Process	Outputs				
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	To	Time (minsec)	Performence Standard(s)	Present Assessment Method
Fire Howitzer	8) Work	ᄣ	Firing mecha-	Lanyard	Atte	ached	CI	00:00	Lanyard properly attached	Observe lanyard
Name	-er eseds	(Self)	nism block			-echa-	(Self.)		to firing mechanism lever	properly attached to
061-270-1507	striction		located in	Firing	firing mechanism nism lever	nism lever			(TM)	firing mechanism lever
	9) Personal		firing position		lever					
Property Deling	Equipment			nism I ovo						
(M100 Series)	alothing	9 4	Command to	Lever	Fire howitzer	Howitzer fired	5		Howitzer is fired properly	Observe howitzer
(m) 103 Oct 163/	10) Opera-	, ,	fire-WR or	Laliyas			Self.		without delay (SM & TM)	fired. Time from
TRI: 61	tional		AMC		pull on lanyard					"FIRE" command to
	state				on the command					actual weapon firing
References/Notes		1			"FIRE"		į			
				Breech	Open preechblock	<u>.</u>	: ::		Breechblock opened cor-	
• FM6-13B (Pg. 6-		· · · · ·		Dlock	by depressing	and operating			rectly and operating handle	open and operating
12)					operating nandle	namore in stowed			In lorward, stowed position	
TM9-2350-303-10				Operat	detent plunger;	position			(IM & DM)	stowed position
(Chapter 2)				Ing Landlo	pull operating	·				m-s-i
This analysis				Detent	until populating					
covers firing only.				Plunger	_					
,				)						_
				Operat-	cradle cam; and					
				9	return operating					
				Handle	nandle to stowed					
				Pointer	Check pointer is	Pointer is in	CI		Rammer properly stowed	Visually observe ram-
					in black band	black band and	(Self.)		and latched; pointer in	mer properly stowed
					<u>.</u>	rammer is			black band (TM)	and latched; pointer
			-			properly stowed				correctly returned to
					stowed and	and latched				black band
				Swab	Swab and in-	Powder chamber	l:		Powder chamber and	Observe powder cham-
					spect powder	and obturator	(Self)		obturator head properly	ber and obturator head
				Bucket	chamber and	head swabbed			swabbed and inspected	swabbed and inspected
				Jo	obturator head	and inspected			(TM & SM)	
				Water						
			·					•		
		_		_	_	_	_	_		_

Separate Howitzer	Ļ				Fire Comman	2	i	;		2 Pge	Page 2 of 2 Pages
1					Howitzer in Firing Position	Firing Position	That Class	Task Classification:		Revision 0	0 Date: 1/26/84
					A Swab and	A Swab and Bucket of Water	Variable	le 10 gnitis	LX Procedura (Fixed, Structured)	Analyst:	C. Preusser
	Factors		Inputs		Process	Outputs					į
Function(s)/Tasks	Affecting Performance	From	Content	Equip- ment	Actions	Content	To	Time (minsec)	Performance Standard(s)	ard(s)	Present Assessment Method
T	<del>}</del>			Tube	Inspect tube for obstructions and announce "BORE CLEAR" if unobstructed	1	Ch See		Tube properly inspected and free of obstructions; "BORE CLEAR" properly announced with no delay (TM & SM)		Observe tube free of obstructions and hear "BORE CLEAR" announcement: time from "FIRE"
P-04											

Revision 0 Date: 3/16/84 Analyst: R. Bloom Task Classification: LX Procedural (Pixed, Struct I J Variable (Cognitive, Semi Prequisites: Digital Comm. Estab'd w/FDC Chief of Section Howitzer Section

L				Inchite		Process	Outpute					
		Affecting		STROM	Follip-		Candana		Time		Present	
	Function(s)/Tasks	Performance	From	Content	ment	Actions	Content	To	(minsec)		Assessment Method	
(4	Process Pire	1a) Visibility	FDC	Displayed Fire	2	Receive audible	١	Ze ić			None until CYCLE	
ں	Commands	environmen-		Command:	(SCA)	alarm and visual	task	(Ch. Sec.)		served promptly	key is activated, or	
_		tal		Audible alarm		signals				П	announcement is made	
		5) Weather		and message		Announce "Fire	it of			accu-	Compare announcement	_
		9) Personal		header		Mission," number	fire mission,	<b>A</b> G		rect	with data and lormat	
		equipment				of gun, number	numper of gun,	ن ن		format (TM, FM)	guidelines	_
		and clothing				of mission, type	number of mis-					_
		)				of mission con-	sion, type of					_
						trol	mission control					_
S	SM Task # & Name				SCA	Press CYCLE	Acknowledgment	FDC			ACK received by FDC	
<u>·                                     </u>						key	signal			ACK received promptly by FDC (TM, TC)		_
	Operate Gun Dis-				SCA	Observe ACK in	Decision that	);  }  }		d properly	Ch Sec proceeds to	
, 0	play Unit (Section					display window	ACK was sent	(Ch Sec)			next appropriate step	
<u>د ن</u>	Chiefs Assembly)		FDC	Fire mission	SCA	Cycle through	(See below)			(See below)	(See below)	
	•			data (stored in		Fire Mission						
_	TRI: Unknown			SCA)		Commands				Т		_
<u> </u>					SCA	Press appropriate		<u></u>		Appropriate key is pressed	Observe promptness of	_
<u>=</u>	References/Notes					keys to display	or requested fire (Ch Sec)	(Ch Sec)			cycling	_
<u>!</u>						data	mission message					
•	<ul> <li>TC6-1-2 (May 83)</li> </ul>	-					element			T		
•	. TM11-7440-283-				SCA	Read/announce	Announcement	ບ່		L	Compare dispirated with	_
	12-2					data from Com-	of next or re-	AG		rectly announced (FM)	announced message	_
						mand bar and	quested fire	ပ			element	
						sequential dis-	mission message					
						play window:	element or com-					
						• Type of mis-	mand					
_						Sion						
_						• Type of mis-						
						sion control						
_		_				• Special			_			
						Instructions						
						• Shell						
						• Lot			_			
						Rounds			_			
-						• Charge						
						• Fuze						
_						• Deflection						
						• Time			-			
						• & CICVALIOII						

Revision 0 Date: 3/16/84 Task Classification: [X] Procedural (Pixed, Structured) [ ] Variable (Cognitive, Semi-Structured) Prequisites: Digital Comm. Estab'd w/FDC Chief of Section Howitzer Section

Analyst: R. Bloom

	Postone		Inoute		Process	Outputs				
	Affecting			Fouin-				Time		Present
Function(s)/Tasks	Performance	From	Content	ment	Actions	Content	To	(minsec)	Performance Standard(s)	Assessment Method
		G. AG.	G, AG, Repeated com-		Hear repeated	Decision that	Self		Commands are correctly	Compare announced
		`ပ	mands		commands	commands were	(Ch Sec)			with repeated com- mands
		ن <del>۷</del> ن	Roginest February		Hear requests for	Decision to re-	100		re cor-	None, until command
		ပ	C of commands		repeating com- mands	peat commands	(Ch Sec)			is repeated
<del></del>				SCA	Repeat com-	Repeated com-	G, AG,		Command is repeated cor-	Compare displayed
	-				mands as needed		<u>်</u> ပ			with announced com- mand
-				SCA	• If safe and	READY message FDC	FDC			
<del>1=</del> 6					ready, press READY				ceived by FDC (TM, TC)	received READY message
		FDC	If AMC, com-	SCA	• If AMC, re-	Acknowledge	FDC		Audible and visual signals Compare sending of	Compare sending of
			mand to fire		ceive alarm	(ACK) message			observed promptly (TM, TC)	message and At N at
			(FIRE)		and the com-					ruc
					mand to FIRE;					
<del></del> .					edgment					
				SCA	. If proper fire,	SHOT/RC mes-	FDC		,	Compare time of fire
					press SHOT/	sage			rectly received (TM, TC)	With receipt of mes-
					RC after each					Sage at FDC
					round is lired		,100		1	Compare desired with
				SCA	• Successively	Message ele-	5 5 8 5			compare desired with
					press CYCLE	ments	(Cu Sec)		is correctly acquired and	acquired and an-
					or outer ac.A					accuracy and con-
					חסוושים פנ			_		sistency
					needed					•
				SCA	<ul> <li>Press SHOT/</li> </ul>	SHOT/RC mes-	FDC		,	Compare fire time of
					RC one extra	sage, twice			rectly and promptly re-	linal round with re-
					time after	(final round)				ceipt of message at
					linal round is					
					Ilred					
	<u> </u>									
								-		
			-							

#### APPENDIX C

#### AGGREGATED TASKS AND TRAINING DEVICE ASSESSMENT

#### (Task Three Results)

#### Table of Contents

	Page
Introduction	C-2
Aggregated Tasks	
FO/FIST	C-3
FDC	C-4
Howitzer	C-5
Training Technology Assessment	
FO/FIST	C-6
FDC	C-7
Howitzer	C-8

#### APPENDIX C

#### AGGREGATED TASKS AND TRAINING DEVICE ASSESSMENT (Task Three Results)

#### Introduction

The results of Task Three have been summarized on pp. 9-11. "aggregated tasks" that were compiled in the course of Task Three have been used as the basis for the GTT System Requirements (Section V). say they define the content of what the GTT is supposed to training the gunnery team to do. Because these particular results are especially useful in defining the GTT. the following figures summarizing them have been included Figure C-1, C-2 and C-3 show the aggregation of tasks in each of the subsystems. The central column of each is a list of the aggregated tasks while to the left are shown the component Soldier's Manual task numbers. This allows a "crosswalk" among this appendix, Appendix B and Appendix A. To the right of the aggregated list are shown the positions to which each task applies (this crosswalks with the Operational Sequence Diagram in Appendix A). Farther to the right is a summary of the training media assessment. This assessment was made on a task by task basis to determine the most feasible means of training each Soldier's Manual task. These assessments were averaged to obtain the number shown here for the aggregated task. The circled value denotes the most feasible medium for this named task. The TRI is the mean value of the Training Requirements Index assigned to each Soldier's Manual task. The index is discussed in Section VIII.

A summary of training device and simulator assessment is shown separately for each section of the gunnery team in Figures C-4, C-5 and C-6. The assessment was made for each device or simulation currently in the Field Artillery inventory. Because devices, simulations and operational equipment are included, the title of Training Technology Assessment was used. The ratings used are shown on each figure. In the body of the figure, the rating of each device for each aggregated task is shown. At the right side of each figure is a summary assessment of the extent of new device development required for each aggregated task. That assessment attempts to estimate the effort needed to produce a device suitable for completely training the named task.

Figure C-1.

Aggregated Engagement Tasks to be Trained

#### Forward Observer/Fire Support Team

						<del>,</del>	<del></del>		
	Aggregate	TRI (Mean)	70	11	7.3	12	75		20
-			1.2	1.5	1.3	1.6	:		7.
	ment	Aug Opl Opl Eqt Eqt	2.0	2.1	2.2	1.9	1.4		2.1
	Issessi	E	2.3	2.5	2.6	2.4	2.8	· · · · · · · · · · · · · · · · · · ·	2.8
	fedia A	TDs	2.6	2.6	2.8	2.6	8:		1.7
	Training Media Assessment	Instr Demo Mtls	0.7	0.8	0.7	1.0	1.9		0.0
	Train	Instr De Alone M	0.3	0.1	0.1	0.2	8.0		0.0
-	<del></del> _	¥ ĕ		-	- °				
		n Trained FS Sgt	X FIST DMD	×	×	×	×		×
!		Section Position Trained FO FIST Ch FS Sgt	X FIST DMD	×	×	×	×		×
		Ş. O.	X DMD	×	×	×	×		×
		Engagement includes the following topics (aggregated) to be trained in a team setting	1. Using the DMD and FIST DMD to prepare, transmit, receive and forward messages related to all fire missions.	2. Using the GLLD to measure range and to illuminate targets; using on stationary or moving targets; using in daylight or night-time operations.	3. Using the LRF to measure range.	4. Using vistus/manual devices (map, plotting equipment, binoculars, compass) for: determining object location, altitude; recording data; drawing and using terrain sketch.	5. Decision-making related to all fire missions. Including: a) Target detection, identification, classification, threat assessment and location relative to zone of	hesponsoluty.  b) Target selection, based on threats, priorities and commander's guidance. c) Command fire to engage selected target (fire, adjust fire data). d) Evaluate mission to determine call for further adjustment or EOM. e) Safe operating procedures.	6. Timely operation under stated snvironmental conditions.
	83-5302 83-5303 83-5305	091-5 091-5	× × × ×	××	x x x	x x x x x	× ×		x x x
	83-2022	7-190	×	×	×	×	×		×
1	83-2002 83-2002	7-190	× .	×	^	×	×		×
	83-2004 83-2003		× ×	×	×	×	×		×
×	83-2003 83-2001	2-190	×	x x	×	××	×		××
B E	83-1929	2-190			×	×	, ,,		×
Σ	83-1623				×			_	×
Z	83-1025 83-1051		×			×	×		××
×	83-1015	Z-190	×	×	×	×	×		×
A S	1		×	×	×	×	×		×
<b>⊢</b>	1101-88	7-190	×	×	×	×	×		×
S	83-1003	180		×	×	×			×
	83-1001 83-1001		×	×	×	×			×
	6862-02	.Z-190	×	×			×		×
	9868-12		×	X X		*	×		×
	44-3977		×	×		×	×		×
	9268-12	7-190		×			×		×
	8788-47 4788-47			×		×	×		×
1	3-1003	- 1	×		i İ				×

Figure C-2.

Aggregated Engagement Tasks to be Trained

#### Fire Direction Center

Aggregate	TRI (Mean)	92	2.2	73	7.
	Eg	1.1	1:1	1.9	1.9
nent	Aug Opi Eqt	2.0 1.1	2.0	2.1	6.1
Training Media Assessment (Mean)	Sims		2.0	(F)	(g)
edia A:	TDs		2.6	2.1	1.8
Majur	Instr Demo Mtls	9.6	0.4	0.9	0.0
Trait	Instr Instr Demo Alone Mtls	0.0	0.0	0.3	0.0
	Section Position Trained	BCS Opera- tor (Com- puter)	BCS Opera- tor (Com- puter)	BCS Opera- tor (Com- puter)	BCS Opera- tor (Com- puter)
	Engagement includes the following topics (aggregated) to be trained in a team setting	1. Using BCS to process and evaluate RFA (Autonomous) messages related to adjust fire, fire-for-effect, quick fire and Copperhead (target-of-opportunity) missions.	2. Using BCS to process TACFIRE messages related to adjust fire, fire-for-effect, time on target and and specified fire plan missions.	3. Plotting/replotting targets on map, using BCS to receive and transmit related data.	4. Timely operation under stated environmental conditions
TBD	COP- PER HEAD	×	7228	, L S	×
TBD			×		×
-190		×	×	×	×
-190	280- 1001			×	×
-190	279- 2017 BCS	×			×
-190	279- 2016 TACF		×		×
E R	279- 2011		×	×	×
H W 0	- 279- 2 4 2005 2 2F BCS			×	×
Z -196	279- 2004 TACF		×		×
1	279- 2003 TACF		×		×
	279- 2002 TACF		×		×
-	279- 2004 BCS	*	}		×
196	279- 2003 BCS	*			×
19	279- 2002 BCS	×			×

Figure C-3.

Aggregated Engagement Tasks to be Trained

#### Howitzer Section

					,	<del>,</del>
Aggregate	TRI (Mean)	57	61	54	61	58
	Opl Eqt	2.0	1.8	2.2	2.0	1.8
<u>+</u>	Aug Opl Eqt	2.2	2.0	3.0	1.3	2.0
essme	Sims	2.6	1.7	1.7	2.3	2.6
edia Ass (Mean)	TDs	1.9	£2)	1.5	£.8	1.6
g Med	Instr Demo Mtls	0.6	1.7	0.7	1.0	0.0
Training Media Assessment (Mean)	Instr Demo	0.1	0.7	0.2	0.3	0.0
	C2,3,4,HD Instr	X Rpt by	×		X shell fuze charge	×
	Section Position Trained	X Rpt by voice	×		X X X load shell breech fuze fire charg swab clear	×
	Positi AG	X Rpt by voice		X Elev'n Range Quadr		×
	ction	X X Rpt Rpt by by voice voice		X X De- Elev'n flec- Range tion Quadh Colli-		×
	ChSec	X (GDU/ SCA & An- nounce)	×	X X X X Cunner's De- Elev'n Quadr flee- Range Coord tion Quadr W/G Colli-		×
	Engagement includes the following topics (aggregated) to be trained in a team setting	<ol> <li>Using GDU/SCA and/or voice to receive, annouce and repeat com- munications related to all fire missions.</li> </ol>	2. Initiating, observing, evaluating and correcting operating procedures/conditions to insure safe handling and firing of the howitzer and ammunition.	3. Aiming the Howitzer in elevation and deflection, using the elevation quadrant/range quadrant/direct fire scope and the pantel/collimator, respectively.	4. Loading, firing and clearing the Howitzer.	5. Timely operation under stated environmental conditions.
TBD		X				×
N U M B E R 061- 061- 061- TBD	270- 270- 271- 1507 1507 1215 (L) (P)	×	:	×		×
U M	- 270- 7 1507 (P)				×	×
N U -	- 270- 2 1507 (L)	×	×		×	×
S K - 061	- 266 8 332		X			×
T A -	5 331	×		×		×
S M 1- 061	5- 266 39 331	×	×			×
S M T A S K 061- 061- 061- 061- 061-	266- 266- 266- 266- 266- 318 3322 1	×		×		×
90	156	×	×		×	<u>×</u>

Figure C-4.

TRAINING TECHNOLOGY: ADEQUACY AND NEW REQUIREMENTS

Forward Observer/Fire Support Team

	Need for New Training Technology (None, Minor, Moderate, Major)	Moderate	Minor	Minor	Moderate	Moderate	Major
plicable)	7. Battle Simulations	Fair	Poor	Poor	PooD	Cood	Fair
, Excellent, Not Applicable)	6. Miniature Moving Target	W/N	Good	Good	N/A	Good	F.89.i
r, Fair, Good	5. Forward Observer Trainer	N/A	N/A	N/A	Fair	Fair	Poor
Training Devices (Absent, Poor, Fair, Good,	4. Training Set Fire Observation (TS FO)	N/A	N/A	N/A	Good	F Bir	Fair
	3. G/VLLD with TV Camera	N/A	Good	N/A	N/A	N/A	Poor
Adequacy of Existing	2. G/VLLD Trainer	N/A	Good	N/A	N/A	N/A	Poor
Adequ	1. Uninstrumented Operational Equipment	Fair	Poor	Poor	Fair	Absent	Poor
	Engagement includes the following topics (aggregated) to be trained in a team setting	1. Using the DMD and FIST DMD to prepare, transmit, receive and forward messages related to all fire missions.	2. Using the GLLD to measure range and to illuminate targets; using on stationary or moving targets; using in daylight or nighttime operations.	3. Using the LRF to measure range.	4. Using visual/manual devices (map, plotting equipment, binoculars, compass) for: determining object location, altitude; recording data; drawing and using terrain sketch.	5. Decision-making related to all fire missions including:  a) Target detection, identification, classification, threat assessment and location relative to zone of responsibility.  b) Target selection, based on threats, priorities and commander's guidance. c) Command fire to engage selected target (fire, adjust fire data). d) Evaluate mission to determine call for further adjustment or EOM. e) Safe operating procedures.	6. Timely operation under stated environmental conditions.

Figure C-5.

# TRAINING TECHNOLOGY: ADEQUACY AND NEW REQUIREMENTS

#### Fire Direction Center

Uninstrumented 2. Battery Computer 3. Battle Simulations System Interface Training Simulator (BCS/ITS)  Fair Good Fair  Poor Good Fair  Good Fair  Good Fair  Good Fair  Fair  Good Fair  Fair  Good Fair  Fair  Fair  Fair  Fair  Fair		(Absent	[2 T]	evices rt Applicable)	
Fair Good Fair Poor Good Fair Absent Poor Fair	includes the spics (aggre- trained in a setting	1. Uninstrumented Operational Equipment	2. Battery Computer System Interface Training Simulator (BCS/ITS)	3. Battle Simulations	Need for New Training Technology (None, Minor Moderate, Major)
Poor     Good     Fair       Poor     Fair     Good       Absent     Poor     Fair	SS to process is RFAF is) messages adjust fire, ect, quick fire head (targetity) missions.	Fair	Good	Fair	Minor
Poor Fair Good Absent Poor Fair	CS to process messages re- ijust fire, ect, time on specified fire ins.	Poor	Good	Fair	Minor
Absent Poor Fair	/replotting tar- np, using BCS and transmit a.a.	Poor	Fair	Good	Moderate
	operation under ironmental con-		Poor	Fair	Major

Figure C-6.

TRAINING TECHNOLOGY: ADEQUACY AND NEW REQUIREMENTS

#### Howitzer Section

			Adequacy of	Existing Train	ung Devices	Adequacy of Existing Training Devices (Absent, Poor, Fair, Good, Excellent, Not Applicable)	Fair, Good,	Executent, N	ot Applicable			
Engagement includes the following topics (aggregated) to be trained in a tenm setting	1. Uninstru- mented Equipment	2. Firing Battery Trainer	3. Artillery Direct Fire Trainer	4. Multiple Integrated Laser Engagement System	5. M31 Subcaliber Trainer	6. Miniature 7. F.A. Shoot- 8. Training 9. Low Cost 10. Battery Moving uble Projectiles Indirect Computer Target Practice and Fuzes Training System / Round Interface Round Training System / System / Round System / System / Round Sy	7. FA Shoot- uble Pructice Round	8. Training Projectiles and Fuzes	9. Low Cost Indirect Training Round	Computer System / Interface Training System System	11. Buttle Simulations	Need for New Training Technology (Noie, Minor, Moderate,
1. Using GDU/SCA and/ or voice to receive, an- nounce and repeat com- munications related to all fire missions.	Poor	Good	V/N	N/A	N/A	Fair	N/A	N/A	N/A	Good	F⊕ir	Minor
2. Initiating, observing, evaluating and correcting operating procedures/ orditions to insure safe handling and firing of the howitzer and amminition.	Absent	Poor	Feir	Fair	Poor	Fair	Fair	Poor	F.	٧/٧	Poor	Moderate
3. Aiming the howitzer in elevation and deflection, using the elevation quedrant/armeg quadrant/direct file scope and the pantel/collimator, respectively.	Abent	Good	Poor	Poor	Poor	Good	N/A	V/N	Poor	N/A	Poor	Minor
4. Loeding, firing and clearing the howitzer.	Absent	Good	Poor	Poor	Power	F.	Fair	Poor	F	V/N	Poor	Minor
5. Timely operation under stated environmental conditions.	Absent	Poor	Poor	Poor	Poor	Poor	Poor	V/N	Poor	Poor	Feir	Mejor